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AUTHOR Evans, Selby H.
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ABSTRACT

A promising measure of learning ability has emerged from extensive research on schema theory: the Schematic Concept Formation (SCF) Test. Experimental evidence has already demonstrated substantial individual differences in SCF performance for third and fourth graders and college students. Because SCF depends on the learning of relatively unfamiliar patterns rather than upon measurement of previous learning, it might be utilized to tap a few of the more important cognitive abilities in ways not presently available. A measure of SCF ability which could be shown to be substantially unrelated to cultural background or educational level, and which had some power to predict learning ability, would be socially relevant and extremely useful in both educational and industrial settings. In order to assess the potential utility in this context, two studies were conducted, a pilot study and a main study. The purpose of the pilot study was primarily to refine the SCF test for subsequent use; the purpose of the main study was to determine the predictive power of the test in a remedial training program. The results indicate that SCF test does have some potential utility as a measure of cognitive aptitude in disadvantaged students, where such aptitudes are defined as aptitudes bearing on success in a remedial training program. (Author/JM)

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Final Report

Project No. 1F053
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Selby H. Evans
Texas Christian University
Fort Worth, Texas 76129

PRELIMINARY STUDIES ON A TEST OF PATTERN LEARNING FOR APTITUDE ASSESSMENT WITH DISADVANTAGED STUDENTS

February, 1973

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

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Preliminary Studies on a Test of Pattern Learning for Aptitude Assessment with Disadvantaged Students

Dr. Selby H. Evans

Mrs. Julia T. Price

Texas Christian University

Fort Worth, Texas 76129

February, 1973

The research reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

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ABSTRACT

Purpose of this project was the development and preliminary testing of a process-oriented measure of cognitive aptitude as an efficient and economical predictor of disadvantaged students' college potential. A Schematic Concept Formation (SCF) Task, utilizing computer generated graph-like and language-like patterns, was designed, refined, and administered to the ninety-eight students in the Developmental Studies Program at McLennan Community College, Waco, Texas, at the beginning of their year of remedial study. At the end of the school year, students' SCF results were correlated with teachers' ratings of learning ability and academic improvement and with the students' academic performance. The demonstrated individual differences in SCF ability of disadvantaged students were shown to have some utility in predicting both teachers' ratings and academic performance.

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I. INTRODUCTION

Many young people—both secondary school graduates and drop-outs —are potential candidates for college education, but because of disadvantaged background (that is, they are academically, socio-economically, or culturally deprived) they cannot succeed in the academic environment without special help. The problem is to identify these people and encourage them to re-enter educational programs, and to make the most effective use of the limited facilities available for developmental or remedial training.

Some disadvantaged youngsters, like many boys and girls from all walks of life, are not likely to benefit from college education. An indication of this probability would facilitate counseling and vocational planning for this group and would perhaps avoid an additional damaging experience of failure for the young person.

Conventional tests are not suitable for discovering scholastic promise in the disadvantaged. Largely designed for middle and upper class Caucasians, these tests require verbal and numerical skills unlike the skills possessed by students of other backgrounds. These tests sample what has been learned instead of measuring learning ability itself. Such tests, which measure the students' weaknesses and gauge deficiencies in subject matter are useful for estimating immediate academic performance. They would reflect learning ability only if all students had been exposed to equal training or experience—obviously not the case with the culturally disadvantaged. Our concern is to sample the learning process more directly and to ascertain the extent to which the student can profit by remedial training.

Achievement in elementary and secondary school may also be an inappropriate indicator of learning potential. Academic achievement is affected by motivational and personality factors influenced by poverty, substandard schooling, discrimination, or other conditions of deprivation.

At the present time, individual interviews are often used for the assessment of applicants for special developmental programs. While this method may be the best tool available, it is highly dependent on the skill of the interviewer and, at best, is time consuming and expensive.

A promising measure of learning ability has emerged from extensive research on schema theory (Oldfield, 1954; Attneave, 1957; Evans, 1964; Evans, 1967a): the Schematic Concept Formation (SCF) Task. We proposed to investigate this measure as a predictor of post-secondary academic achievement of disadvantaged students.

SCF is a well demonstrated phenomenon (Edmonds & Evans, 1966; Edmonds, Evans, & Mueller, 1966; Edmonds & Mueller, 1967; Evans & Arnoult, 1967; Rankin & Evans, 1968; Bersted, Brown, & Evans, 1969; Brown & Evans, 1969; Jones & Holley, 1970; Rankin, Markley & Evans, 1970). It grew out of schema theory, which is a frame of reference for studying the processes involved in pattern learning and pattern perception. Schema theory supposes that humans are able to select the essential or important features—the schema —which characterize categories of objects in an orderly environment.

It has been suggested (Woodworth, 1938; Oldfield, 1954; Attneave, 1957) that people simplify the recognition of objects by remembering these schemata; then new instances are simply encoded as "schema plus correction." The schema would be stored in memory just once and each new instance would be stored by noting only those aspects which deviated from the schema, reducing information processing and storage requirements.

Evans (1967a) extended this idea by pointing out that in an environment containing a mixture of different schemata, people would have to learn to associate objects with their corresponding schema. To account for this learning he postulated the process of schematic concept formation, defined as "the development of the ability to assign objects to their corresponding schema families on the basis of the information derived from perceiving the objects without any other source of information as to the appropriate categorization and without prior familiarization with the relevant schema." A schema family is a population of objects, all of which can be efficiently described by the same schema rule. Subjects can learn to recognize categories of things they have never seen before simply by inspecting several instances of the schema family. They can extract from the environment alone all the information needed to form categories and remember them. No feedback (knowledge of results or reinforcement) is necessary (Evans, 1964). Extended schema theory thus bears not merely on how people remember patterns, but also on concept formation and concept utilization.

Experimental evidence has already demonstrated substantial individual differences in SCF performance for 3rd and 4th graders (Williams and Aiken, 1972), adolescents (Shields, Gordon, & Evans, 1969), and college students (Bersted, Brown, & Evans, 1969). There is evidence that SCF relates to scholastic aptitude in high school students (Shields, Gordon, & Evans, 1969) and we have preliminary evidence of such a relationship in college students.

Because SCF depends on the learning of relatively unfamiliar patterns rather than upon measurement of previous learning, we felt that it might be utilized to tap a few of the more important cognitive

abilities in ways not presently available. A measure of SCF ability which could be shown to be substantially unrelated to cultural background or educational level and which had some power to predict learning ability would be socially relevant and extremely useful in both educational and industrial settings.

In order to assess the potential utility of the SCF test in this context, two studies were conducted, a pilot study and a main study. The purpose of the pilot study was primarily to refine the SCF test for subsequent use, the purpose of the main study was to determine the predictive power of the test in a remedial training program.

II. PILOT STUDY

A. Method

1. Subjects. Subjects for the study were students enrolled in the Developmental Studies Program (DSP) at McLennan Community College, Waco, Texas. This program, initiated in September, 1970, offers one year of intensive remedial training to students who could not otherwise master college work.

All incoming McLennan students are required to take the American College Test[1] and all whose composite score is less than 12 must enroll in the DSP. Upon completion of 30 semester hours in this program, students enroll in regular courses for their final year at McLennan. Most of the school's 2,500 regular students go on to complete a four-year degree; the DSP group is encouraged to do the same.

The 1970-71 DSP class members (N=38) were subjects for the pilot study. The SCF test was administered to these students in October, 1970, about six weeks after they had entered the program.

2. The SCF Test. A form of the SCF Test was assembled using two types of computer generated VARGUS (Variable Generator for Unfamiliar Stimuli) patterns (Evans, 1967b; Evans and Mueller, 1966) which have the following characteristics:

a. They are random samples from defined populations of patterns. Thus, properly analyzed experimental results can be generalized both to the population of subjects and to the population of patterns. Attneave and Arnoult (1956) discussed the importance of such a methodology.

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[1]The American College Testing Examination, Science Research Associates, Inc., Chicago, Illinois.

b. They allow independent control of quantitative stimulus parameters such as information content (channel capacity) and constraint redundancy (the extent to which patterns conform to their schema). For further discussion of these parameters, see Evans (1967c).

c. The task is largely nonverbal in nature and should be relatively free from the effects of training in verbal skills.

d. The patterns are relatively unfamiliar to subjects, and performance is dependent on what subjects can learn on the task itself. Thus performance measures on the task assesses a learning process rather than the result of previous learning (Shields, Gordon, & Evans, 1969).

e. Unlike most cognitive learning tasks, the learning in SCF is based on intrinsic information provided by the task itself rather than on evaluative feedback or knowledge of results. Consequently, the task is suitable for group administration as a pencil and paper test.

f. The patterns, which are initially generated in the form of numbers, can be represented in a number of different forms, so that different cognitive skills can be tapped. In the present study, the patterns were represented both as graph-like figures (serriforms) and as sequences of syllables (Hollier and Evans, 1967) resembling phrases in an unfamiliar language (linguaforms).

The Vargus 9 computerized pattern generation method used in producing serriforms for tasks 1, 2, and 3 of the SCF task samples stimuli from a defined stimulus population in such a way that each may be regarded as a set of independent and measurable deviations from a prototype (Evans and Mueller, 1966).

The Vargus 7 program (Evans, 1967b) generates segments of a Markov process to produce patterns. These patterns, translated into linguaforms, were used in tasks 4, 5, and 6 of the SCF task.

In tasks 1 and 4, subjects were asked to rate the similarity of two patterns, and to judge whether they were from the same schema families. In tasks 2 and 5, they were required to learn to identify examples of a single schema family in the context of patterns from many unrelated schema families. The 3rd and 6th tasks required memory for the previously learned schema family--the subjects differentiated examples of it from those of one other specific family. The original form of the SCF Task contained 40 items per task for a total of 240 items.

3. Measures of Success in the Remedial Training Program. The ultimate criterion of success in the program would be the students' success in subsequent college work. That information, however, tends to be confounded by drop-outs, differential college experiences, and the like. For the main purpose of the pilot study, therefore, success was defined more narrowly as judged success in the program itself. The judgments were provided by the Chairman of the Department, who ranked the students on the basis of his own experience with them as their teacher in the "Personal Growth and Development" course, and on the basis of consultation with the teaching staff. He provided two rankings:

a. Capacity: his judgment of the student's rank in the class with respect to intellectual capacity or potential, regardless of the student's performance in the program; and -

b. Improvement: his assessment of the student's rank in the class with respect to the improvement in the student's scholastic skills during the program, regardless of the student's estimated intellectual capacity.

The rankings were made after the school year had been completed; the department chairman had no knowledge of the student's SCF score when he made the rankings.

B. Results

To provide a preliminary assessment of the relationship of SCF performance to the variables of interest, separate scatter plots were made relating the six subtests to rated Capacity and to rated Improvement. Total SCF score for each student was also plotted against his averaged ratings. These plots were used to permit a visual check against the possibility of nonlinear correlations and to identify the most promising tasks on the SCF task. The plots indicated linear relationships and showed no sign of important non-linearities.

An item analysis was conducted on the SCF data to identify unsatisfactory items. This analysis yielded, among other things, the point biserial correlation between each item and the total score on the subtest which included the item. Items which had very low negative correlations with the subtest were deemed unsatisfactory because they were evidently not measuring the same attribute measured by most of the items on the subtest.

The same item analysis was also performed for subtests, 1, 2, 4, and 5 on data from 375 college students at Cleveland State University.

Comparisons of this analysis with the analysis of the pilot study data indicated substantial consistency between the two with respect to selection of unsatisfactory items. Three or four items on each subtask were clearly identified as unsatisfactory in both analyses. These were dropped from the test, along with a few other relatively poor items so as to reduce each subtest to 35 items. The same procedure was applied to subtests 3 and 6, except that no confirming analysis from the Cleveland State data was available.

The instructions and answer sheets were also slightly modified on the basis of the pilot study to facilitate administration and scoring.

Quantitative analyses of the relationship between SCF performance and the judgments of success in the training program were also made. Because of the relatively small number of S_S (N=38), these analyses were regarded as only exploratory. Preliminary examination of the data indicated that there was a moderate correlation between the two rankings, capacity and improvement. In view of this observation and of the expectation that these rankings probably contained a substantial amount of unpredictable variance, the decision was made to add the two rankings together so as to obtain a single score for each subject -- hopefully a score representing a larger proportion of reliable variance.

A step-wise linear regression was carried out with the combined ranking as the criterion and the scores on the six subtests as predictors. Three additional predictors were also included: the unweighted sum of the scores on the first three subtests, the unweighted sum of the scores on the last three subtests, and the unweighted sum of the scores on all the tests. It was recognized, of course, that these sums were linearly dependent upon the subtest scores, so that they represented no predictive variance not already in the subtest scores. They were used, however, for two reasons: First, an unweighted sum is a simpler alternative to the weighted sum which is implied by a multiple regression; thus the inclusion of unweighted sums would allow a direct assessment of how much predictive power was being gained by treating the six subtests separately as contrasted with forming one or two summary scores. Second, a sum is more reliable than its components taken separately, and reliability was deemed of possibly greater importance here than the optimal weighting offered by linear regression.

A step-wise regression method makes it possible to include linearly dependent items in the set of predictors because it does not attempt to compute a regression equation using all the predictors at once. Instead, it chooses the single variable which affords the best prediction by itself and forms a predictive equation based on that variable. It then chooses from the remaining variables the one which would most improve the predictive power of the equation, and computes a new equation based on these two chosen

variables. In similar stepwise fashion, it continues to add new variables to the equation until a criterion is reached indicating that no further improvement in predictive power is possible.

At each step. the regression program prints out the equation, multiple regression coefficient, and other information which can be used to assess the results. This stepwise method thus allows the user to choose the step at which the results best suit his purpose and so to select a few of the best predictors out of the set originally considered. When sets of items are highly intercorrelated or linearly dependent, some of them are simply left out of the equation.

The stepwise regression analysis revealed that the grand sum of all subtests was indeed the best predictor of the combined rankings. The correlation was only .3, however, and it was not statistically significant. Combining the score on subtest 4 with the grand sum yielded a multiple correlation of .39, and including as a third variable the sum of subtests 1, 2, and 3, yielded a multiple correlation of .47. None of these correlations is statistically significant and they are only mentioned here to indicate the variables which were selected and their effects on the multiple correlation.

The results of the stepwise regression analysis were interpreted as indicating that some correlation might exist between SCF performance and judged success in the remedial training program, although a larger number of subjects would be required to demonstrate statistical significance. The particular variables selected by the stepwise analysis suggested that the test was relatively homogeneous with respect to prediction of this criterion and that subtests 1, 2, and 3, in particular, might be sufficiently homogeneous to be treated as a single variable.

Another criterion which might be considered as representing success in the program is whether the student completed the program or dropped out. A stepwise regression analysis was also carried out using this variable as the criterion and using the same set of predictions as described above. The analysis indicated a significant multiple correlation ($p < .05$) of .53 with score on test 1 and score on test 5 as predictors.

Interpretation of this result is difficult since drop-outs are presumably influenced by motivational, situational, and other noncognitive factors. It is, of course, quite possible that performance on the test reflects motivational characteristics also, as one would expect of almost any test. The predictors in this case were not those found most useful for predicting the rankings, so that the characteristics being used for this prediction were evidently different.

In January, 1972, records were obtained of the actual performance of the pilot study group in their first semester of regular classes. Because of the small number of subjects in the pilot study, a complete analysis of prediction with respect to this criterion did not seem likely to be useful, especially since there appeared to be some curvilinearity in the relationship. Instead, an assessment was made of the effect that would have been obtained if the SCF test had been used for selecting the students. On the basis of the scatter plot relating overall SCF performance to average rankings by the department chairman, a cutting score between 150 and 160 on the SCF test appeared suitable for producing a maximum discrimination between high and low rankings. Accordingly, a cutting score of 156 was taken to see what effect would have been produced on first semester regular college performance if that cut-off score had been used in selecting the students for the DSP program.

The results of this hypothetical selection were as follows: at the end of the first regular selester, 60% of the students had achieved a passing grade point average. Of those who would have been admitted with a requirement of 156 on the SCF test, 90% achieved a passing grade point average. Because of the curvilinear relationship, the results were less satisfactory with respect to those students who would not have been admitted under the SCF test requirement. Of these, 40% achieved passing grade point averages. Only 38% of the students achieved the SCF test requirement, so that the test would have been useful only with a rather favorable selection ratio, but the possible utility of the test for this purpose is worth noting.

In a separate study intended to obtain some indication of the extent to which the SCF test is sensitive to cultural differences, the SCF test was administered to 64 business executives in the Fort Worth area. The total scores for the executives ranged from 113 to 195. For the pilot study group, the total scores ranged from 115 to 184. A detailed comparison of SCF performance from these two culturally very different groups is given in Table 1; the comparison suggests that the cultural differences are not associated with substantial differences in SCF performance.

The preliminary findings from the pilot study suggested that further research on SCF performance as a predictor of college potential in disadvantaged students was warranted. The results of the pilot study were presented in a symposium at the April, 1971 meeting of the Southwestern Psychological Association, and are included in the proceedings of the symposium (Evans and Ellis, 1972).

TABLE 1

Comparison of SCF Test Results in McLennan DSP Pilot Group with those of 68 Business Executives

SCF Score	McLennan Mean	Executive Mean	McLennan Std. Dev.	Executive Std. Dev.
Test 1	29.6	30.2	3.8	4.3
Test 2	27.5	28.4	6.1	4.1
Test 3	27.8	25.9	6.8	9.5
Part I	84.9	84.2	12.2	13.4
Test 5	20.9	21.5	3.2	4.1
Test 6	22.7	22.5	5.0	5.4
Part II	66.9	67.3	6.6	8.1
Total	153.1	155.1	14.4	18.4

III. MAIN STUDY

A. Method

1. Subjects. Subjects for this study were the students (N=98) who enrolled in the Developmental Studies Program in September, 1971. In other respects, they were similar to the subjects in the pilot study. The main study subjects included 50 Caucasians, 35 Blacks, 9 Chicanos, and 4 American Indians. The mean ACT for the subjects was 10.2, with ACT scores ranging from 3 to 16. The national mean for the ACT in 1971 was 20, with standard deviation of 5.

Four of the subjects were dropped from the study because of early departure from the DSP.

2. The SCF Test. The test was the revised form developed in the analysis of the pilot study results. It consisted of six subtests of 35 items each. An example of the test is included in the appendix. The test was administered in September, 1971, shortly after the beginning of the semester.

3. Measures of Success. In summer, 1972, three measures of achievement in the program were obtained. Persons providing the information had no knowledge of the performance of students on the SCF test. The measures were as follows:

a. Academic Record. This record was initially available in the standard A through F scale. Advice from the DSP staff, however, indicated that the principal discrimination being made was A-B, indicating definite success, versus C-D-F, indicating lack of success. Since the letter grade distinctions within these categories were thought not to represent reliable distinctions, academic performance was treated as a dichotomy, success versus non-success, indicated by the average grade.

b. Rating of Learning Ability. The DSP staff rated each student according to judged learning ability. The ranking method used in the pilot study was not used in this case because the DSP staff did not feel they could give a meaningful rank ordering for 98 students. The rating was made on a three point scale, again in compliance with the advice of the DSP staff that finer discriminations were not feasible. The three points were characterized as follows: poor - 0, average - 1, excellent - 2. Each rating was made by the chairman of the department in consultation with another teacher of the student.

c. Rating of Improvement. The students were rated as to the extent to which they had profited from the program, regardless of estimated potential. The scale was the same as the scale for learning ability, and it was used for the same reasons.

B. Results

Summary SCF test results are given in Table 2. Again, individual differences in performance were evident. Because of the inclusion of a "Cannot Say" category in the answer sheet of the revised form of the test, these statistics are not directly comparable with those of the pilot group and of the business executives described in the pilot study.

Table 3 presents the single best prediction for the criteria of success in the DSP program. In accord with the indications of the pilot study, the measures obtained from the SCF test do show significant correlations with each of the criteria. Moreover, the total score and the subtotal on tests 1, 2, and 3 appear to contribute most to prediction of success. This finding also agrees with the results of the pilot study. The correlations among the three criteria were as follows: between rated learning ability and rated improvement, the correlation was $r = .66$ ($p < .01$); between academic performance and rated ability, the correlation was $r = .56$ ($p < .01$); between academic performance and rated improvement, the correlation was .45 ($p < .01$).

Since the criteria were evidently measuring some of the same characteristics, they could usefully be combined to form more general summary criteria. Therefore, Table 3 also presents results with respect to a summary criterion representing all three criteria. The summary criterion for each S was formed by taking the unweighted mean of his scores on the three separate criteria obtained from the DSP.

From a practical standpoint, the most appropriate criterion of success in the DSP is not any measure taken in the program itself, but some measure of how well the student performed in subsequent experiences - especially in the immediately subsequent semester. A complete assessment of DSP success by that criterion would, of course, require a control condition to show how much the students benefited from the DSP as compared to how well an equivalent group did without the DSP. An investigation of that magnitude was beyond the scope of the present study, but it is of interest to ask how well the SCF test predicted subsequent academic performance in the student's first regular semester. That information is given as the last entry in Table 3. The criterion was grade point average obtained in the fall, 1972, semester after completion of the DSP in the spring, 1972, semester. Four students did not complete the fall, 1972, semester and their data were omitted in computing the correlation between SCF variables and subsequent academic performance.

TABLE 2

Summary Statistics of McLennan DSP Group on the SCF Test

	Mean	Standard Deviation	Range of Scores
Test 1	20.7	3.8	11-29
Test 2	20.5	4.4	7-29
Test 3	15.7	4.9	5-31
Part I	57.0	9.0	33-80
Test 4	15.8	3.5	4-24
Test 5	14.3	3.2	5-23
Test 6	14.8	3.2	7-25
Part II	45.0	6.9	23-62
Total Score	101.9	12.87	77-133

TABLE 3

Single Best Predictor for Several Criteria of Success in DSP from SCF Scores

Criterion	Predictor	Correlation
1. Academic Performance in DSP	Total Score	.45 (p <.01)
2. Rated Learning Ability	Subtotal 1, 2, 3	.35 (p <.01)
3. Rated Improvement	Subtotal 1, 2, 3	.38 (p <.01)
4. Mean of all DSP Criteria (1, 2, and 3 above)	Subtotal 1, 2, 3	.42 (p <.01)
5. Subsequent Academic Performance	Test 2	.33 (p <.01)

Table 4 presents the results of multiple regression analysis for prediction of the various criteria of success. A stepwise regression analysis was used as discussed in the pilot study. The same predictors were used as in the pilot study. The results reported here are for the best three variables. (Technical considerations in tests of signigicance argue against selecting the number of variables to be reported on the basis of the statistical test.) In no case did variables beyond the best three produce more than a trivial increase in the multiple correlation. In each case, the multiple correlations are statistically significant, but the improvement over the single best predictor is not great.

Thus, it appears that, as the pilot study suggested, the test is relatively homogeneous with respect to prediction of these criteria. Apparently, most of the predictive power of the test is captured in the unweighted sum of all subtests and in the subtotal which is the unweighted sum on tests 1, 2, and 3. Some additional predictive power may be offered by test 2, since it does occur frequently as an additional predictor.

It may be noted that academic performance was the variable best correlated by SCF. For comparison, the American College Test yielded a correlation of .14 (not statistically significant) with academic performance. Thus it appears that the SCF test offers substantially better predictive power in this context than does the standardized aptitude test.

IV. DISCUSSION

The results indicate that SCF test does have some potential utility as a measure of cognitive aptitudes in disadvantaged students, where such aptitudes are defined as aptitudes bearing on success in a remedial training program. The obtained correlations are not large, but the substantial agreement between the results of the pilot study and those of the main study suggests that the finding of this relationship is not merely statistically significant, but is replicable from year to year. Moreover, the present test is surely not yet optimal, and some improvement in correlations should be attainable by further refinements.

For practical purposes, a correlation does not have to be very high to be useful, especially when the selection ratio is favorable. Seashore (1953) has noted that relatively few validity coefficients especially in industry, are above .50. The validity coefficient represents a more precise prediction than is required for selection; moreover, selection often takes advantage of the fact that prediction is usually better in discriminating the extremes than in accurate placement in the mid-range of a scale. Thus it is often better to consider, instead of the correlation, the direct effect of selection with a given validity on percentage of successful students.

TABLE 4

Multiple Regression Analysis for Prediction of Various Criteria of DSP Success from SCF Scores

Criteria	Predictors	Beta Weights	Multiple Regression
1. Academic Performance (in DSP)	Total Score	.219	.49
	Test 6	.217	(p <.01)
	Test 2	.169	
2. Learning Ability	Subtotal 1, 2, 3	.279	
	Test 2	.179	.40
	Test 5	-.142	(p <.01)
3. Improvement	Subtotal 1, 2, 3	.310	.40
	Test 2	.133	(p <.01)
	Test 6	-.041	
4. Mean of all DSP Criteria (1, 2, and 3 above)	Subtotal 1, 2, 3	.296	
	Test 2	.183	.45
	Test 6	.056	(p <.01)
5. Subsequent Academic Performance	Test 2	.220	.37
	Subtotal 1, 2, 3	.225	(p <.01)
	Test 6	-.072	

As an illustration, consider the effect on the Developmental Studies Program, if this test were used in selection of students (assume that its predictive validity for academic performance is essentially what was found in this study, that is, .5): By the present selection methods, 60% of the students received satisfactory ratings—they were successful in the DSP program in terms of their academic performance and/or in terms of rated learning ability and degree with which they were able to benefit from the program. What percentage of improvement could be expected if the SCF task were used as a selection device? For an answer consider Table 5. Values for this table were obtained from the Taylor-Russell tables. (Taylor & Russell, 1939).

At present, about 60% of students now accepted for training are successful, according to the criteria used in the present study. With a .50 selection ratio, (only 50% of the students are accepted) the SCF test would increase the proportion of successful students to .76. Even if 80% of the students are accepted (selection ratio .8) the increase to 67% could be useful if cost per student is high.

Of course, it is not recommended that SCF test performance be used as the sole standard for admission to the DSP. Indeed, the DSP is not at present obliged to limit its enrollment. But if the test were being considered for use, it would be appropriate only as part of a battery of selection procedures. Before the SCF test could be considered for use elsewhere, of course, a good deal of additional validation data would need to be accumulated.

More generably, much further research is indicated along theoretical lines. Gough's (1965) proposed three-stage test evaluation would be desirable for SCF: the present type of study, having to do with validity, would be the primary evaluation. Secondary evaluation would elaborate on the meaning of that which is measured and tertiary evaluation would concern the importance of the measure beyond its primary area of relevance. For example: SCF has been identified, demonstrated, and correlated with certain other behaviors, yet the underlying basis for it is unknown. Is SCF dependent on innate neurological differences? Is it genetically influenced? Can its functioning be localized in the brain?

From a practical standpoint, other modes of SCF should be investigated, such as an auditory form of the Task for possible use with music students or blind people. Is pattern perception via the various senses identifiable as the same process? What about three dimensional patterns? What work-related behaviors are associated with SCF ability? These and many other questions remain for the secondary and tertiary stages of research on SCF.

This research is consistent with Evans (1967a) formulation of SCF as cited in the introduction of this paper. Humans can extract relevant features from the environment in order to classify objects and to identify future instances of the same pattern family. Measurement of this ability by use of a test such as the one developed for this project has utility in areas of application where usual selection devices are ineffective.

TABLE 5

Hypothetical Example: Possible Effect of Using SCF Test to Select Students for DSP

A. Selection Ratio	B. Percentage of Successful Students Without Use of SCF Task	C. Percentage of Successful Students With Use of SCF Task*	D. Difference in Percentage Between Columns B & C
.50	.60	.76	16
.60	.60	.73	13
.70	.60	.70	10
.80	.60	.67	7

*Assuming r = .5

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APPENDIX

GENERAL INSTRUCTIONS

People often learn to recognize complex patterns without giving it much thought. Recognizing a person's handwriting pattern is an example of this ability. It is fairly easy to recognize a person's handwriting pattern even though it is never exactly the same from time to time.

To illustrate how people recognize complex patterns, you have a sheet of paper containing 5 pairs of handwritten words. Your job is to decide for each pair whether the handwritten samples represent the same pattern or two different patterns (i.e. they were written by the same person or by two different people).

How to respond. Choose among the statements below the one that best represents your opinion about each pair of patterns and enter the letter (a, b, c, d, or e) representing it on the answer sheet after the number corresponding to each pair of patterns:

a. The patterns are very similar to each other and very probably belong to the same class.
b. The patterns are fairly similar to each other and seem likely to belong to the same class.
c. The patterns are not really very similar or dissimilar and it is hard to say whether they belong to the same class or not.
d. The patterns are fairly dissimilar and it seems likely they don't belong to the same class.
e. The patterns are very dissimilar and quite probably belong to different classes.

Remember you must decide if the handwritten words represent the same pattern or two different patterns; then you must indicate how similar the two examples are. Take no more than 20 seconds for each pair. Do you have any questions?

Answer Sheet for Handwritten Samples

1. _____

2. _____

3. _____

4. _____

5. _____

HANDWRITING SAMPLES

(1) Colleges

(2) increment

(3) swelling

(4) impatient

(5) moment

braiding

favorite

disparate

precious

realize

Task 1

Instead of handwriting in this task, you will be looking at unfamiliar graphs. None of them will be exactly alike, but some of the pairs will be examples representing the same pattern, while others will be examples representing two different patterns.

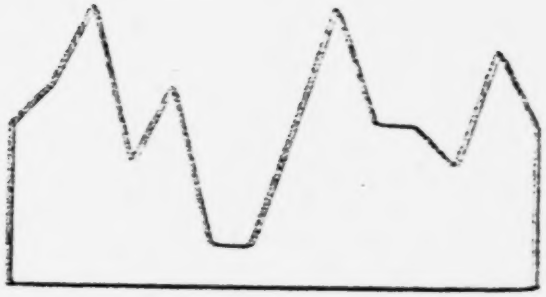
In other words, they will be just like the handwriting samples, and you are to deal with them in the same way, by entering the letter that corresponds to your judgment on appropriate space on your answer sheet. Use the same response alternatives:

a. The patterns are very similar and probably belong to the same class.
b. The patterns are fairly similar and seem likely to belong to the same class.
c. The patterns are not really very similar or dissimilar and it's hard to say whether they belong to the same class or not.
d. The patterns are fairly dissimilar and seem likely to belong to different classes.
e. The patterns are very dissimilar and probably belong to different classes.

You will be given plenty of time to finish, but you will do better if you work quickly and rely on your first impression. Are there any questions? If not, wait for the signal to start the task.

Answer Sheet for Task 1

1. ____	16. ____	31. ____
2. ____	17. omit	32. ____
3. ____	18. ____	33. ____
4. ____	19. ____	34. ____
5. ____	20. ____	35. ____
6. ____	21. ____	36. ____
7. ____	22. ____	37. ____
8. ____	23. ____	38. ____
9. ____	24. omit	39. ____
10. ____	25. omit	40. ____
11. ____	26. ____	
12. omit	27. ____	
13. omit	28. ____	
14. ____	29. ____	
15. ____	30. ____	



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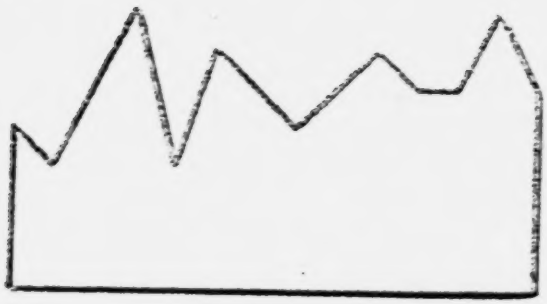

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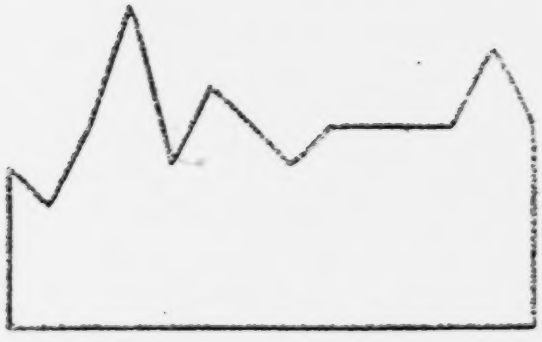

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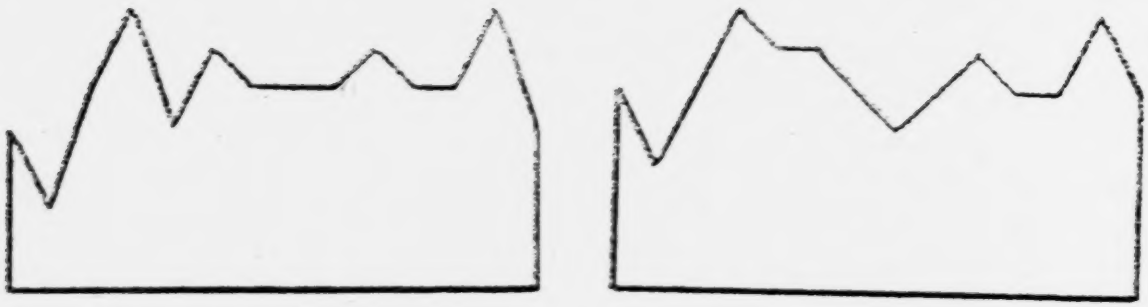

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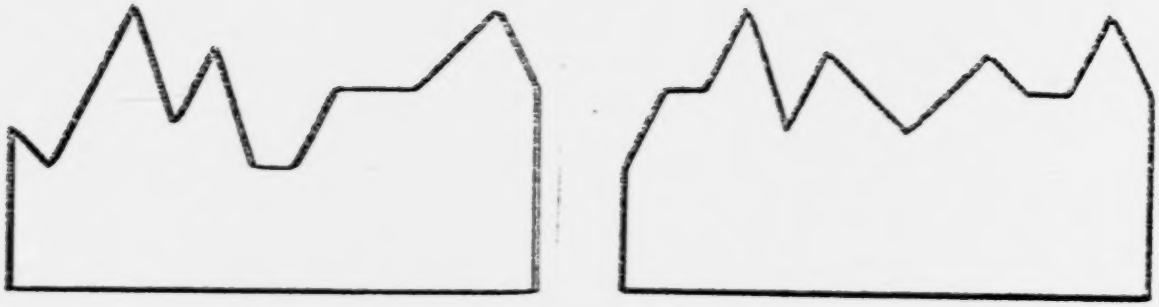

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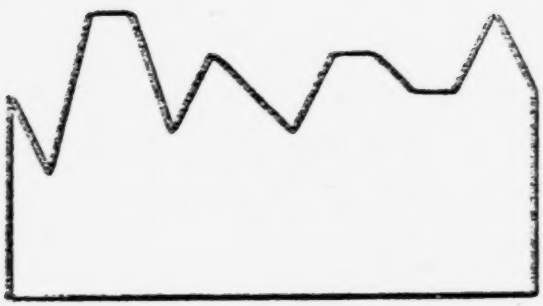

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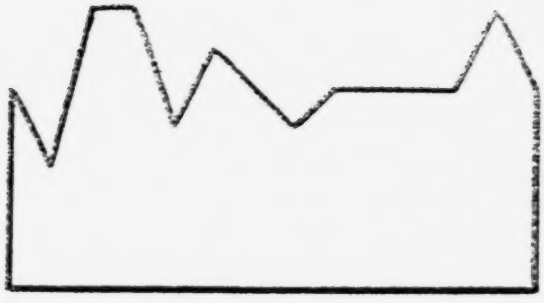

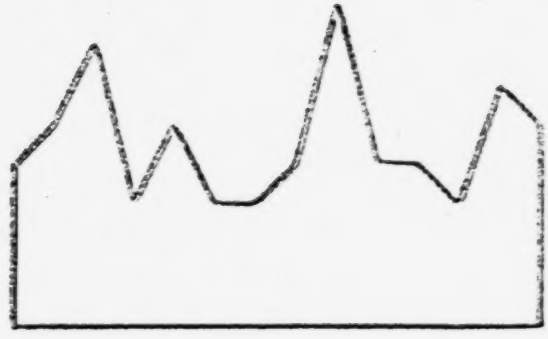

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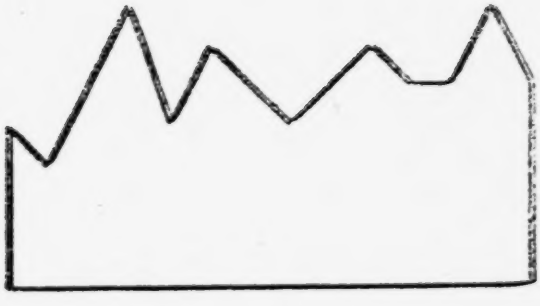

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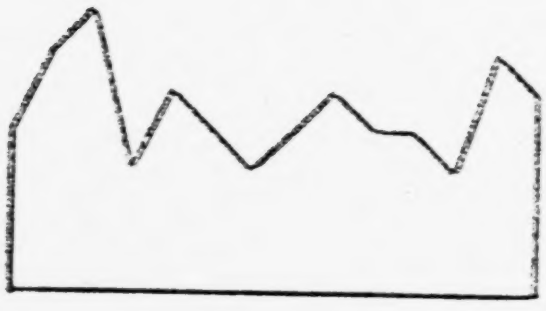

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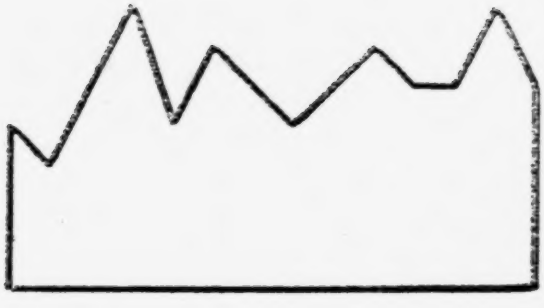

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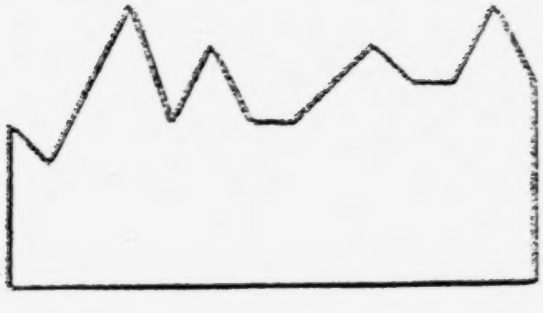

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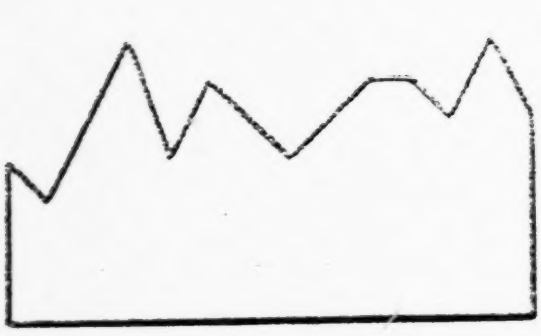

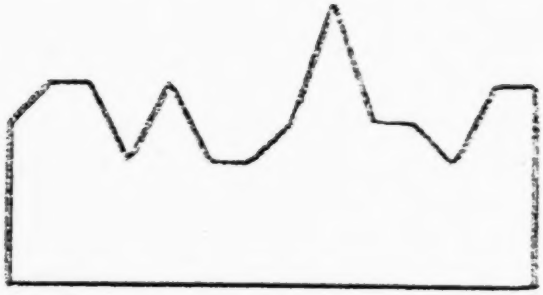

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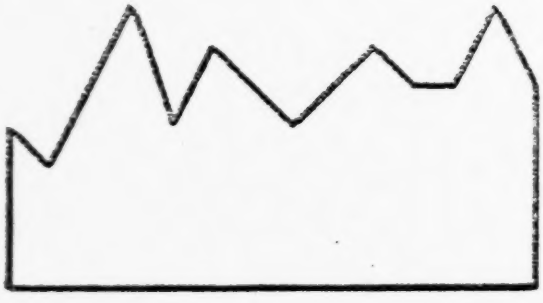

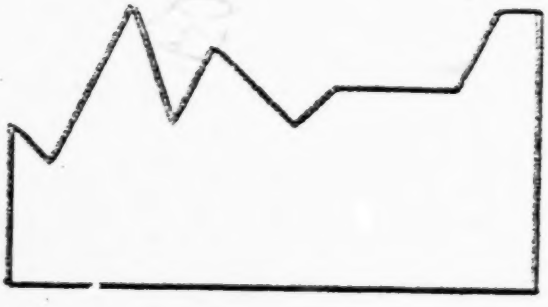

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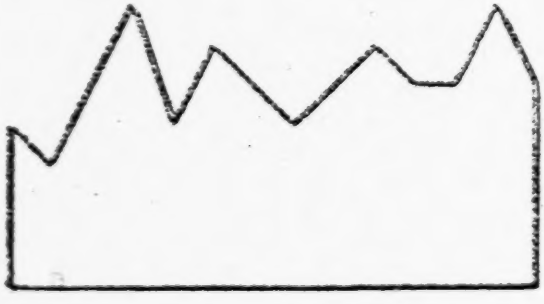

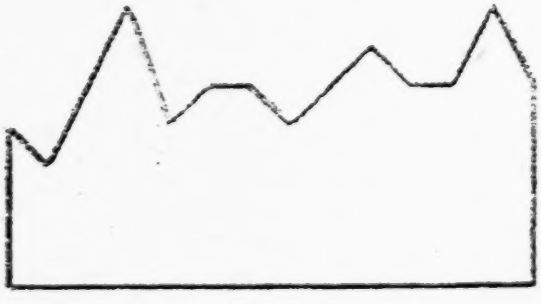

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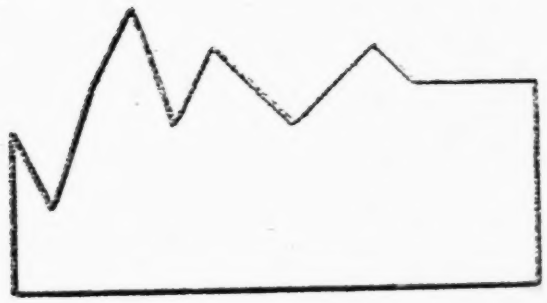

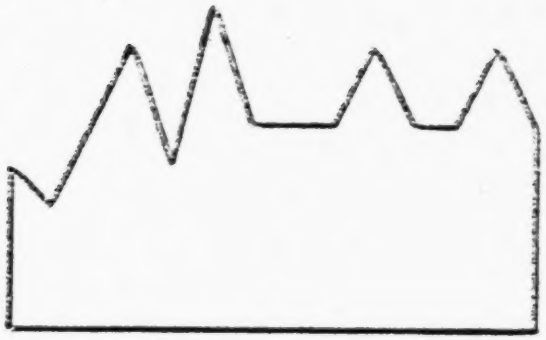

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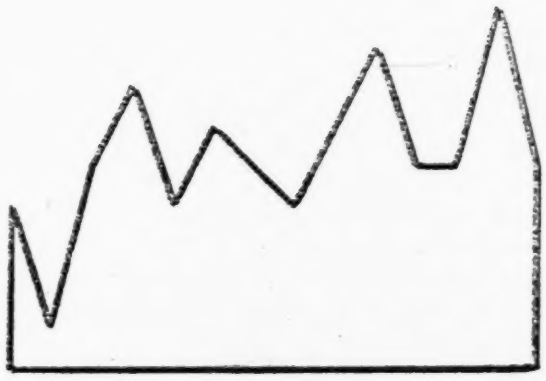

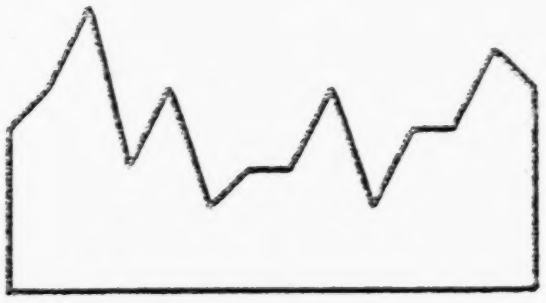

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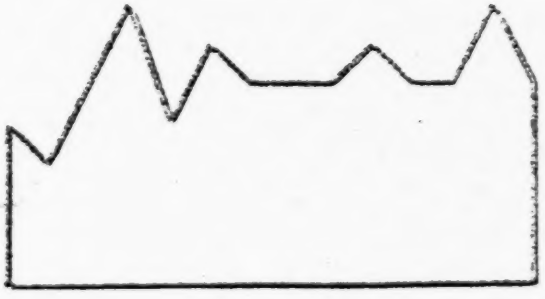

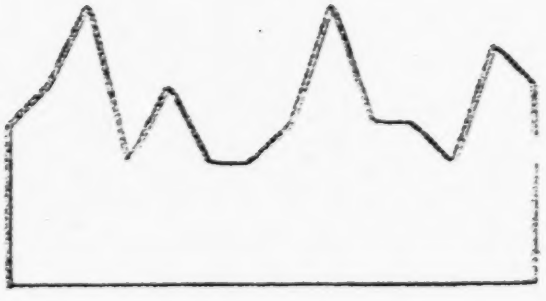

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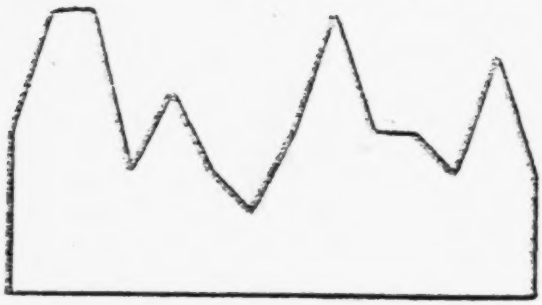

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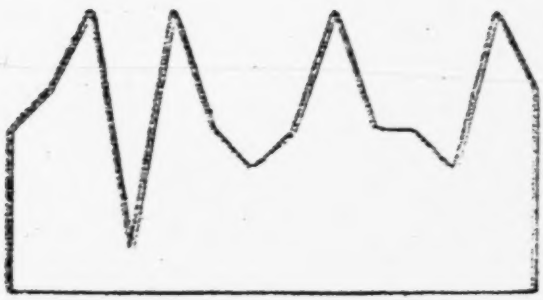

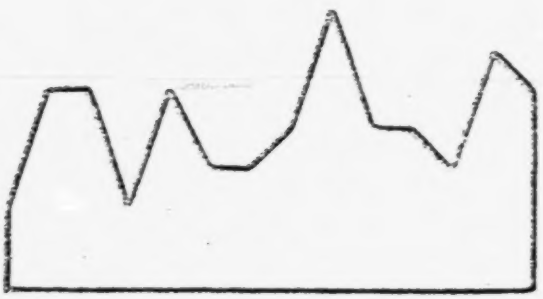

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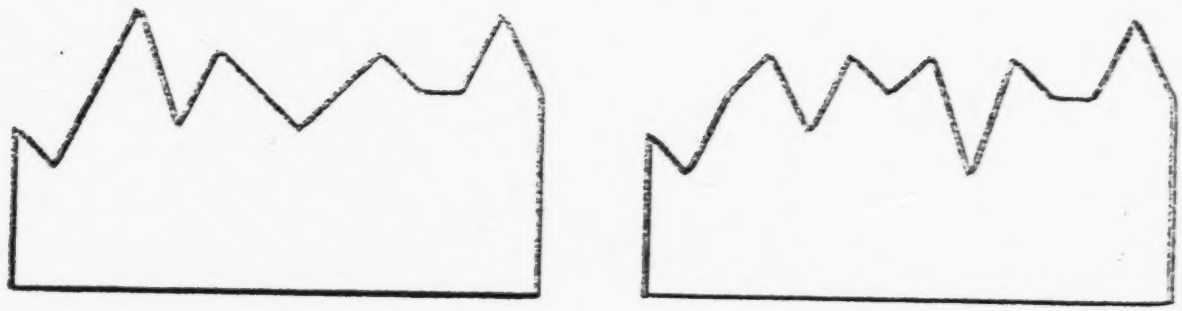

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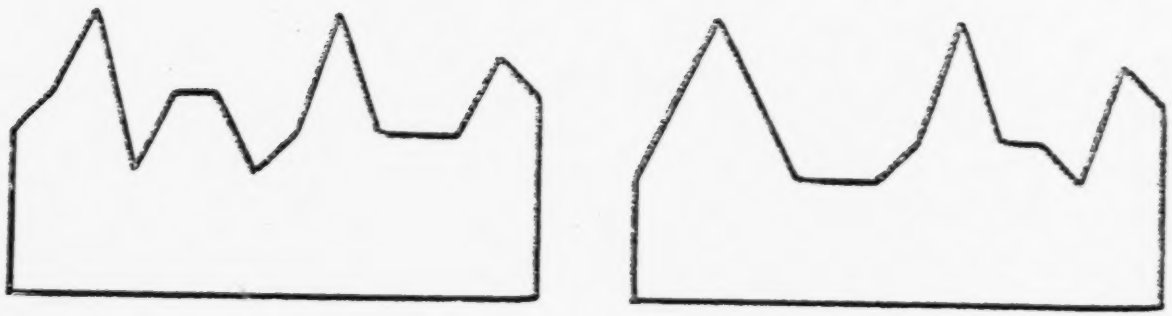

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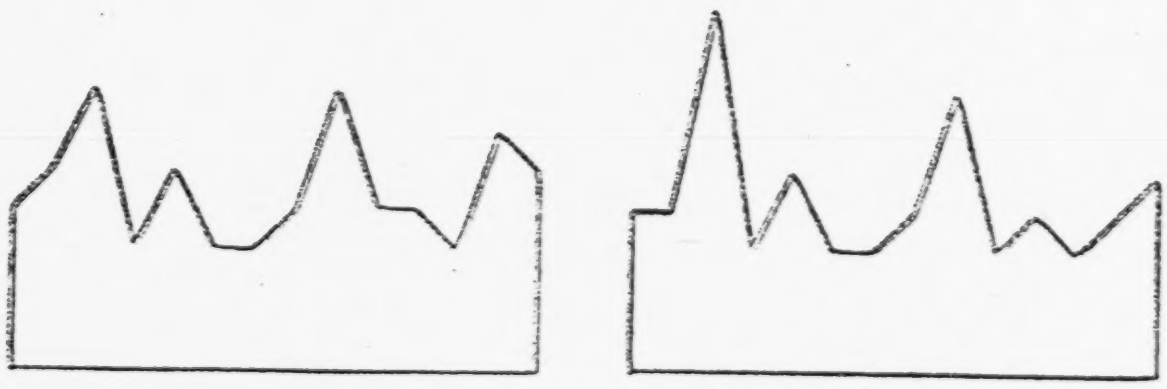

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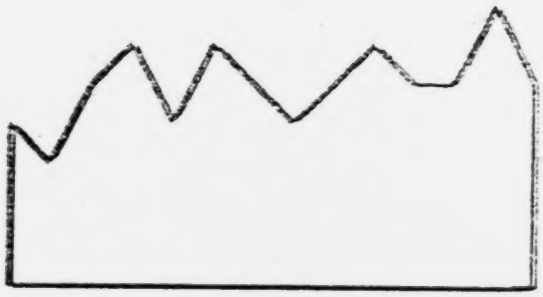

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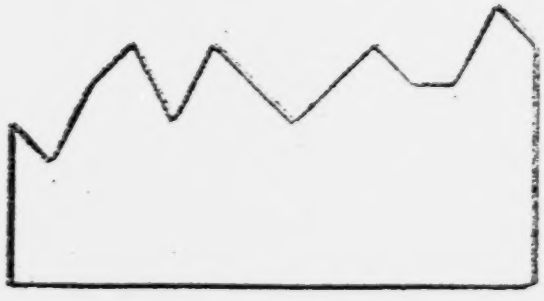

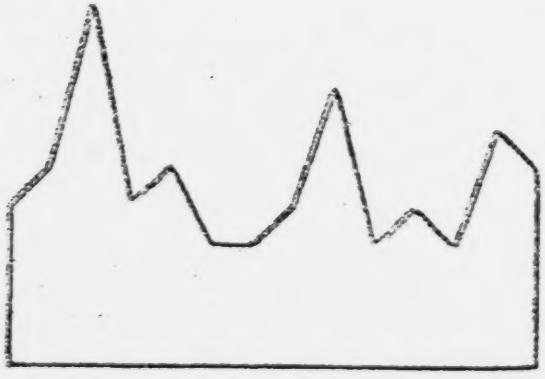

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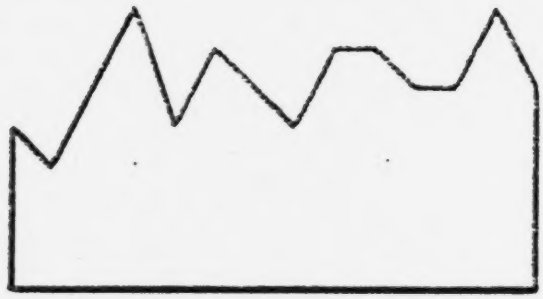

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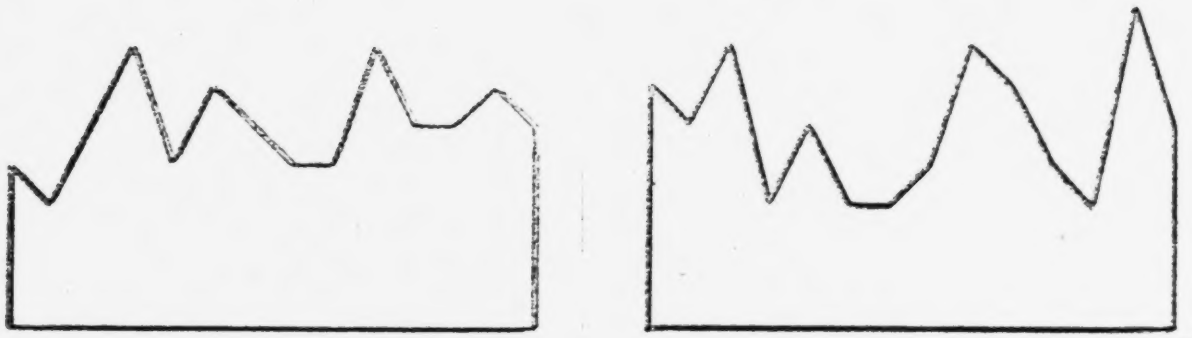

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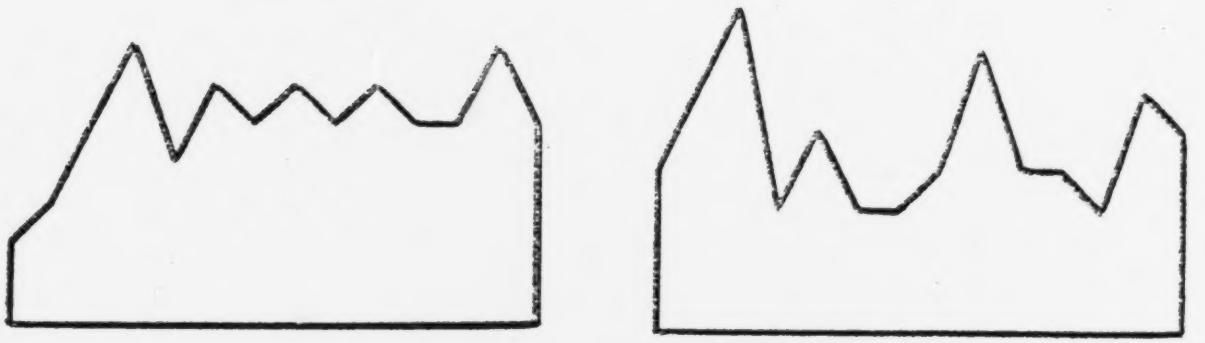

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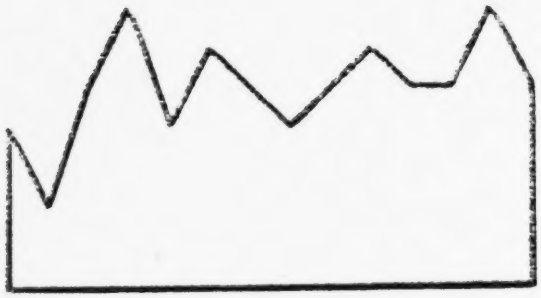

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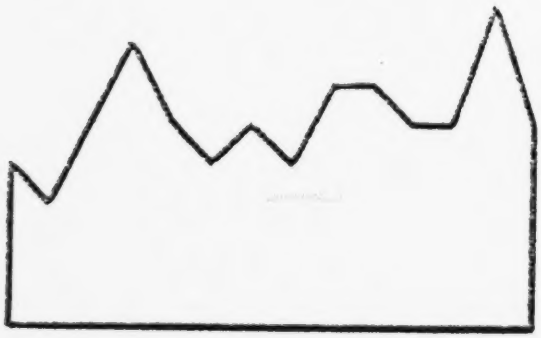
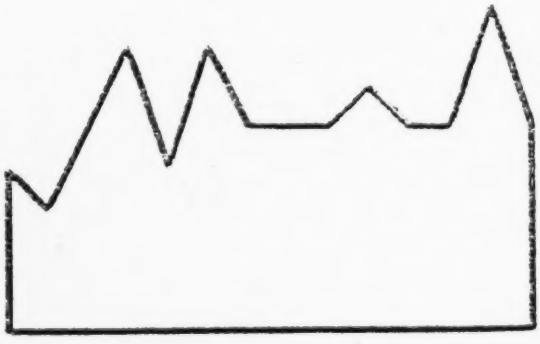




28

Task 2

In this task, you will again be looking at unfamiliar graphs, but there will only be one on a page. A number of the graphs will represent the same pattern - as if we were using a number of examples of the same person's handwriting. The other graphs will each represent a different pattern. Your task is to discover the examples of the recurring pattern. Naturally, you won't be able to tell which pattern is recurring until you have seen a few examples, but soon you should begin to notice it. Keep in mind that two graphs can show the same pattern without being identical.

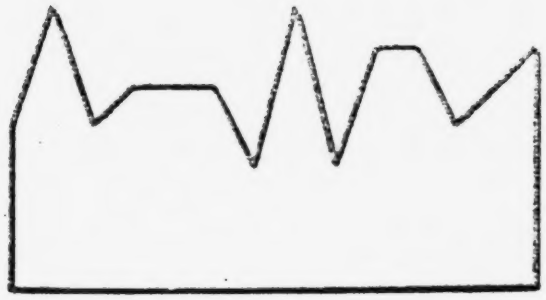
In making your answer please choose one of the following responses, and enter its letter in the appropriate place on the answer sheet:

a. I am very sure this graph <u>is</u> an example of the recurrent pattern.
b. I am fairly sure this graph <u>is</u> an example of the recurrent pattern.
c. It's hard to say if this graph <u>is</u> an example of the recurrent pattern or not.
d. I am fairly sure this graph <u>is not</u> an example of the recurrent pattern.
e. I am very sure this graph <u>is not</u> an example of the recurrent pattern.

One last thing - your third task will require that you remember the recurrent pattern you saw in this task, so try to learn what it looks like. Are there any questions? If not, wait for the signal to start.

Answer Sheet for Task 2

1. _____	16. _____	31. _____
2. _____	17. _____	32. _____
3. _____	18. _____	33. omit
4. _____	19. _____	34. _____
5. _____	20. _____	35. _____
6. _____	21. _____	36. _____
7. _____	22. _____	37. _____
8. _____	23. _____	38. _____
9. omit	24. omit	39. _____
10. omit	25. _____	40. omit
11. _____	26. _____	
12. _____	27. _____	
13. _____	28. _____	
14. _____	29. _____	
15. _____	30. _____	



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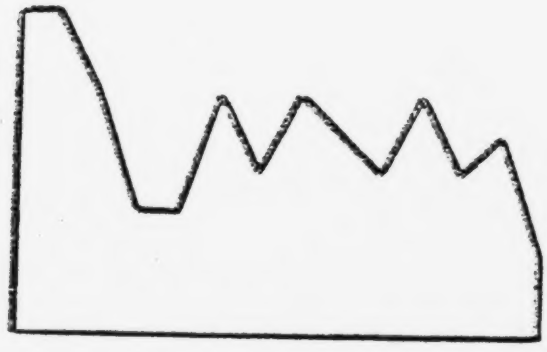

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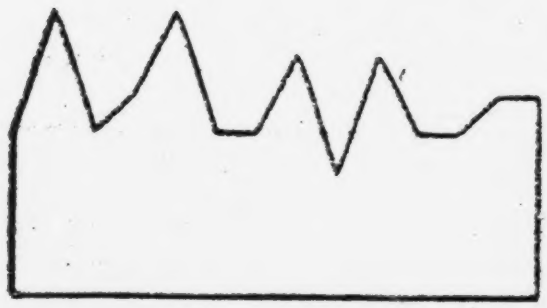

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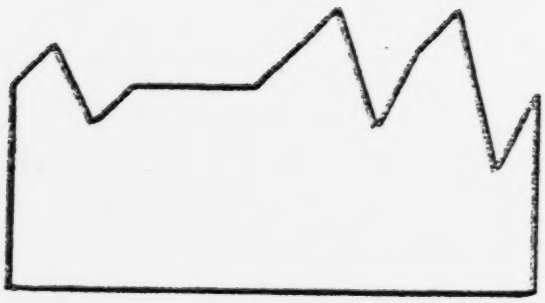

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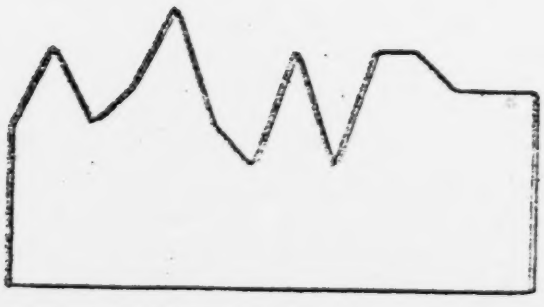

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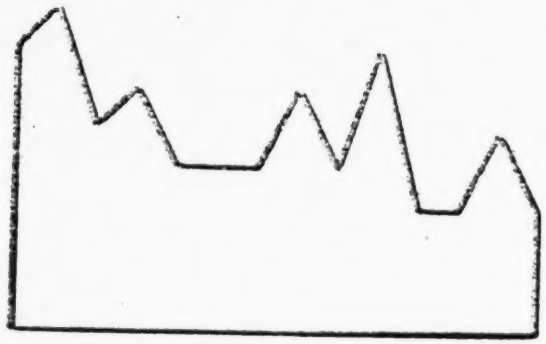

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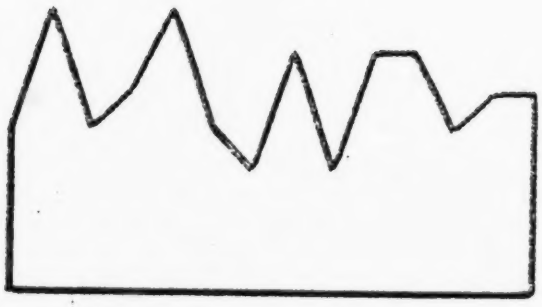

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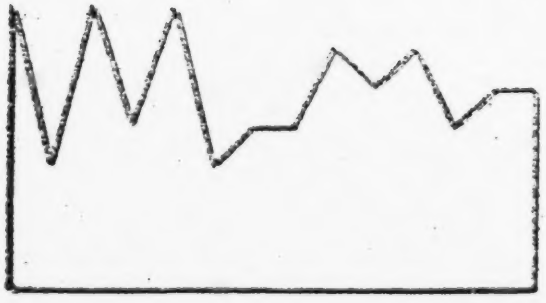

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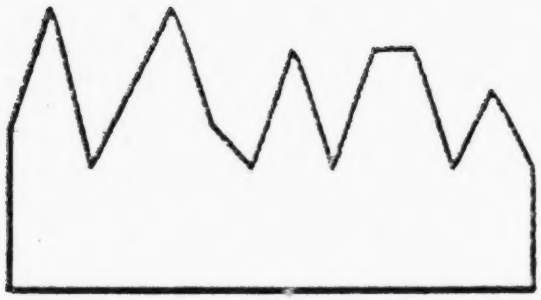

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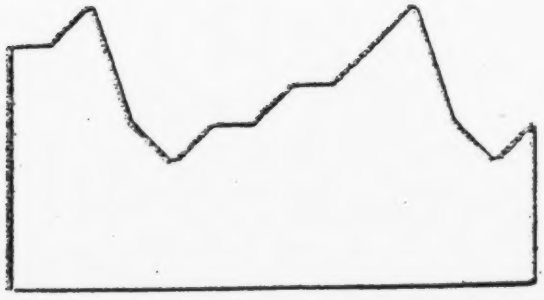

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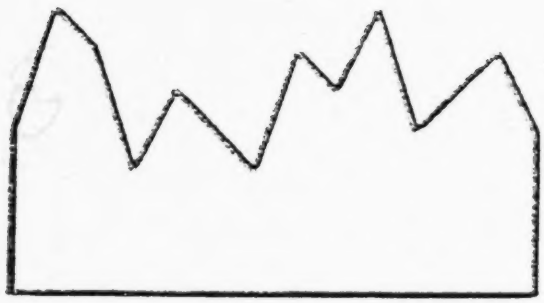

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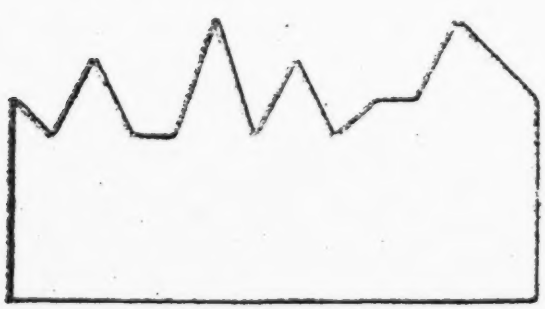

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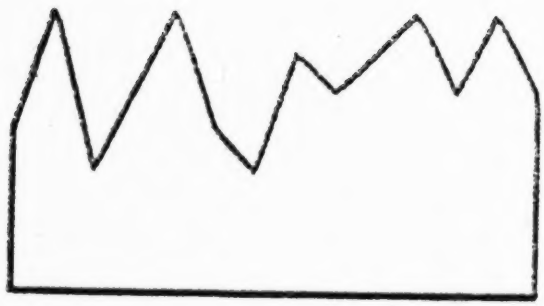

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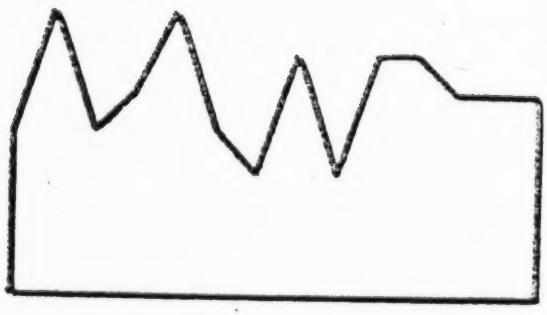

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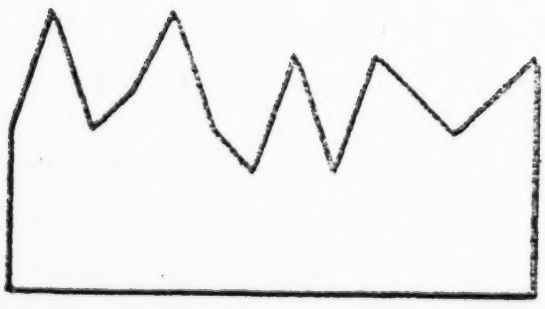

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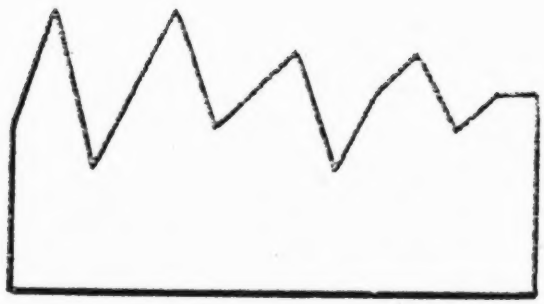

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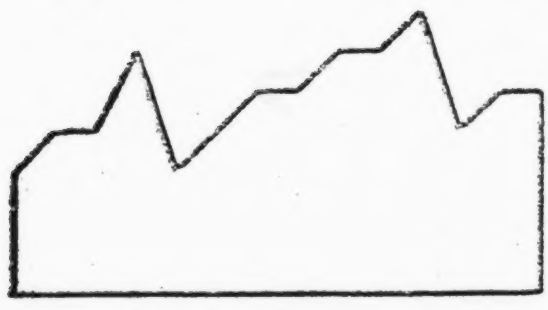

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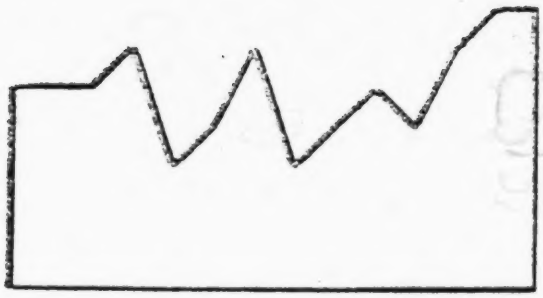

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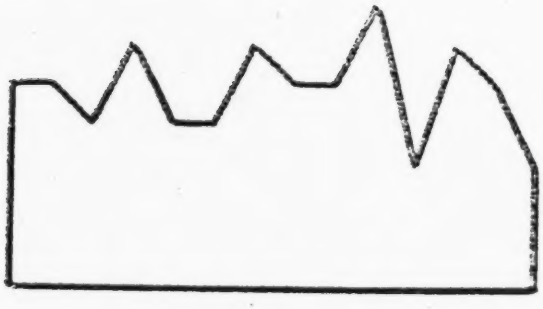

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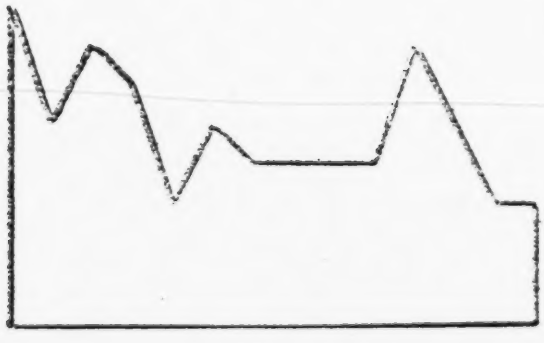

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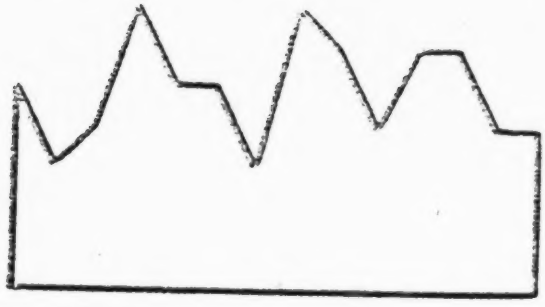

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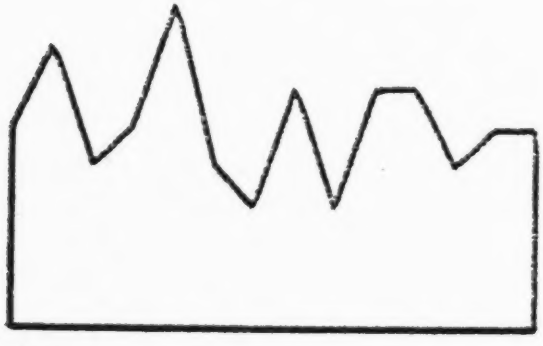

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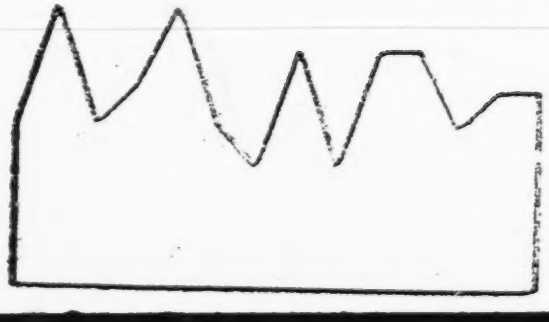

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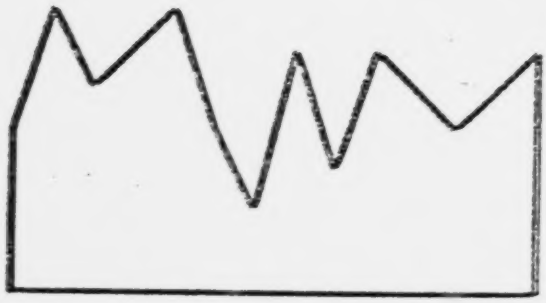

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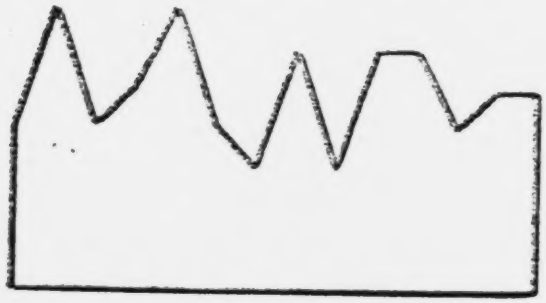

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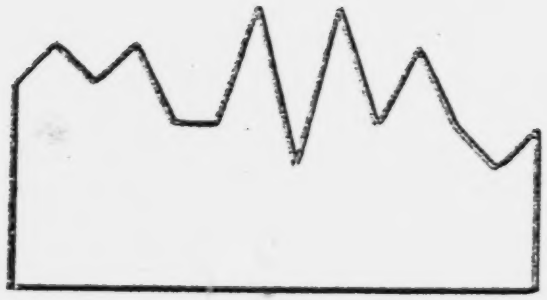

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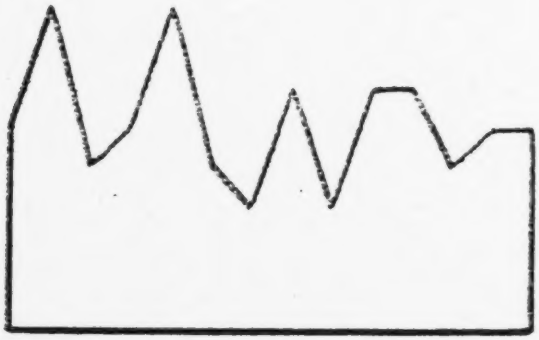

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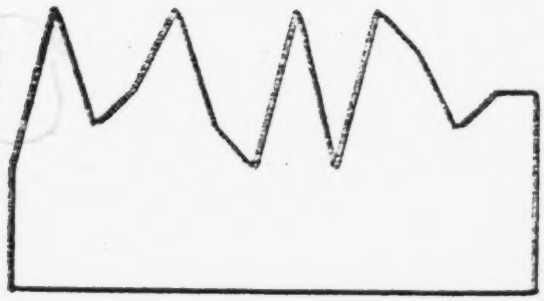

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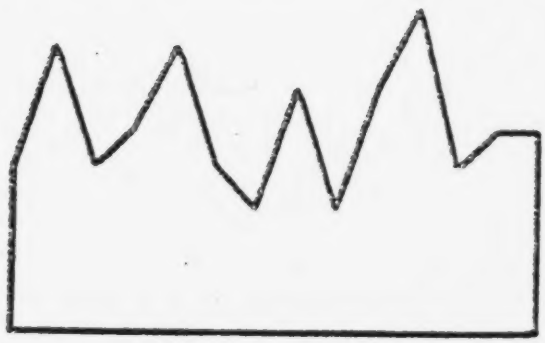


28

Task 3

In this task, you will again look at graphs one at a time. Some of the graphs will represent new examples of the same pattern you saw in the previous task. Others will represent examples of a new pattern, which may also recur. This task will be much like the previous task in that you are again supposed to identify the recurring pattern you learned in the previous task. To make your answer, choose one of the following responses and enter its letter on the appropriate place on the answer sheet:

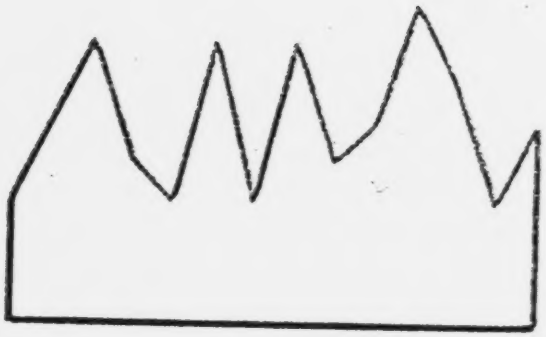
a. I am very sure this graph <u>is</u> an example of the recurrent pattern from the previous task.
b. I am fairly sure this graph <u>is</u> an example of the recurrent pattern from the previous task.
c. It is hard to say if this graph <u>is</u> an example of the recurrent pattern from the previous task or not.
d. I am fairly sure this graph <u>is not</u> an example of the recurrent pattern from the previous task.
e. I am very sure this graph <u>is not</u> an example of the recurrent pattern from the previous task.

Are there any questions? If not, wait for the signal to start.

Answer Sheet for Task 3

1. _____	16. _____	31. _____
2. _____	17. _____	32. _____
3. _____	18. _____	33. _____
4. _____	19. _____	34. _____
5. _____	20. _____	35. _____
6. _____	21. _____	36. _____
7. _____	22. _____	37. omit
8. omit	23. _____	38. _____
9. omit	24. _____	39. _____
10. _____	25. _____	40. _____
11. _____	26. omit	
12. _____	27. _____	
13. _____	28. _____	
14. _____	29. omit	
15. _____	30. _____	

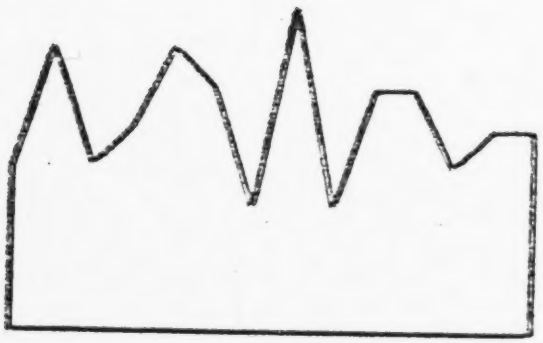
1



15

OMIT

29



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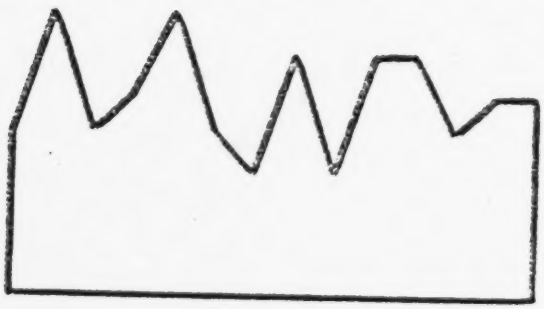

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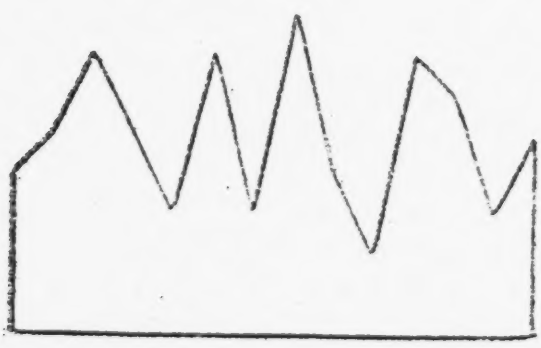

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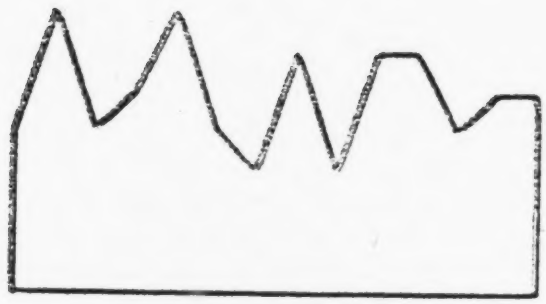

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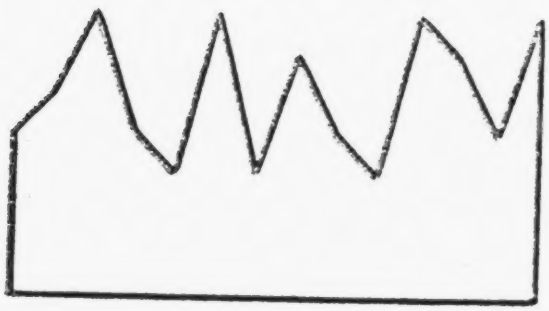

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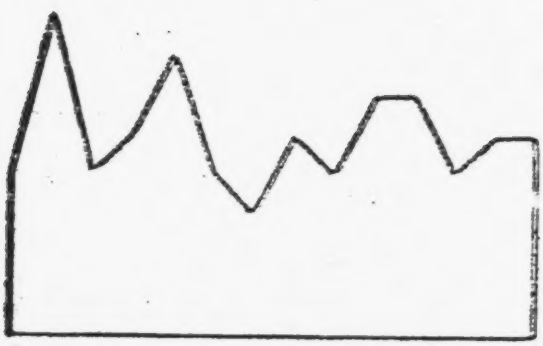

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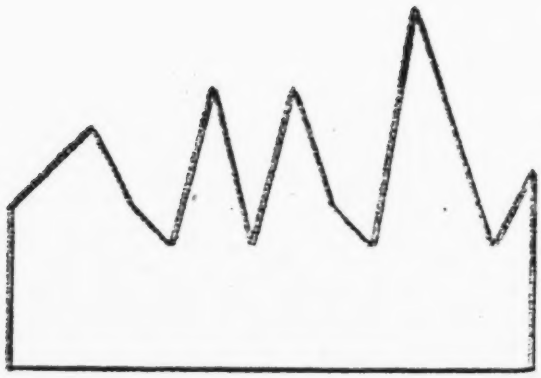

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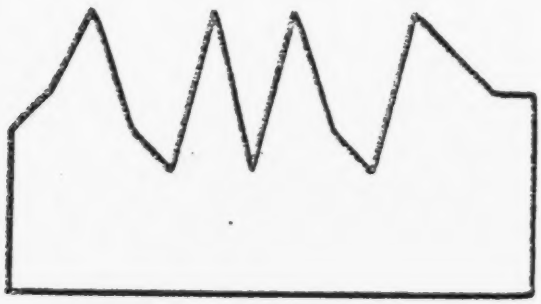

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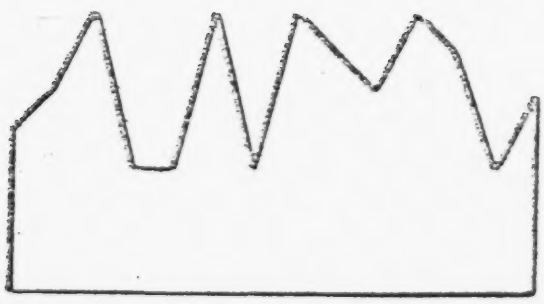

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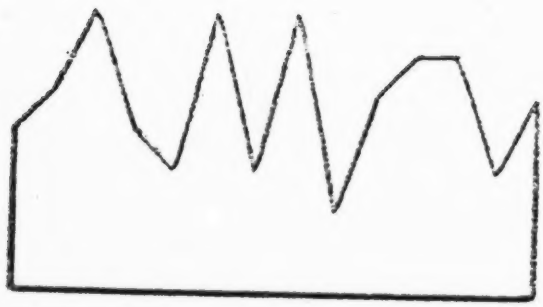

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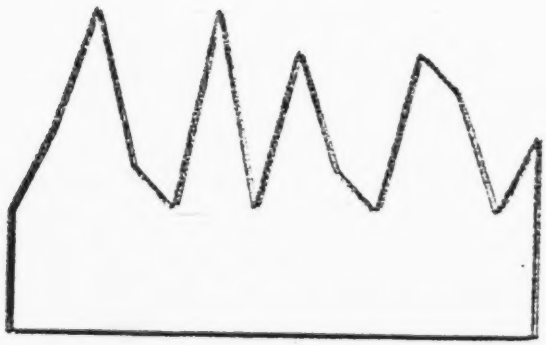

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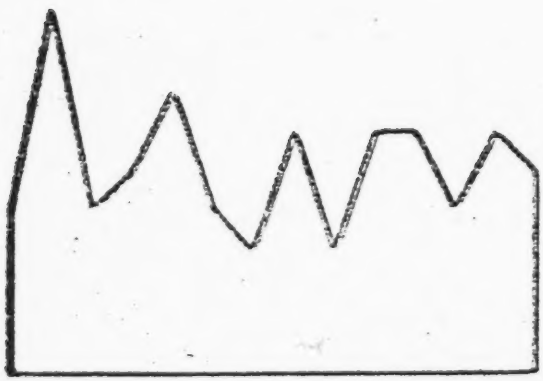

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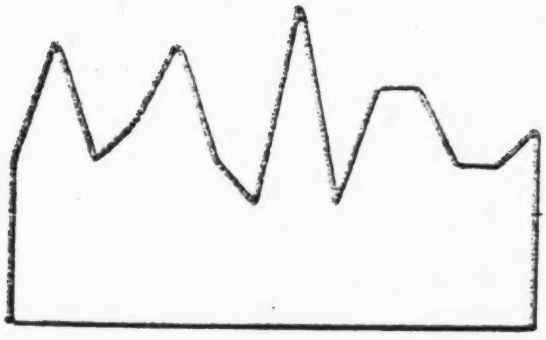

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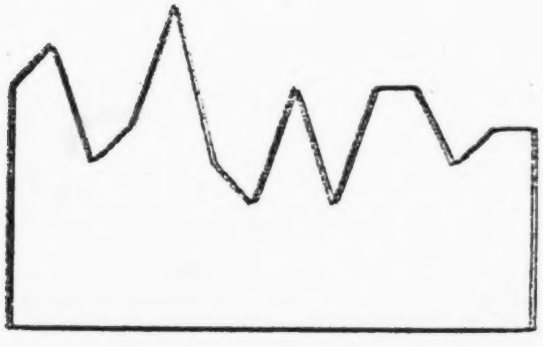

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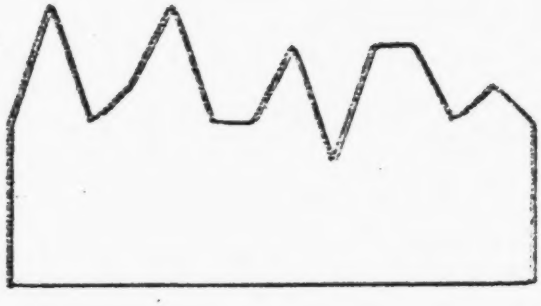

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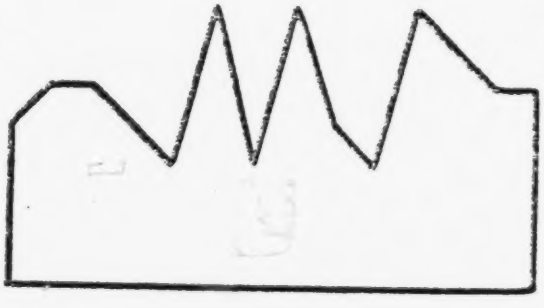

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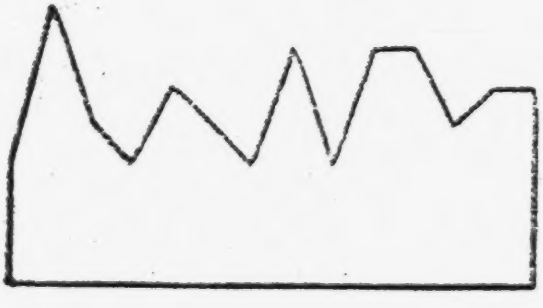

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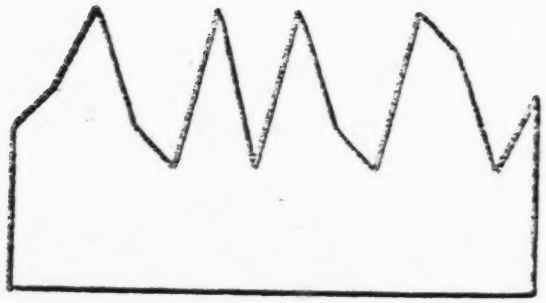

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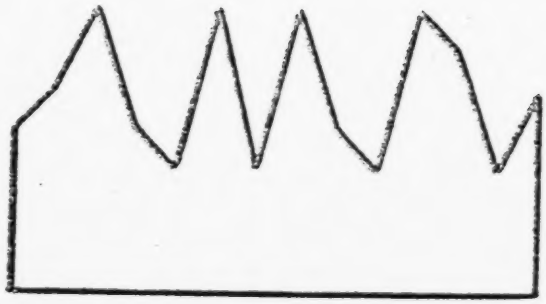

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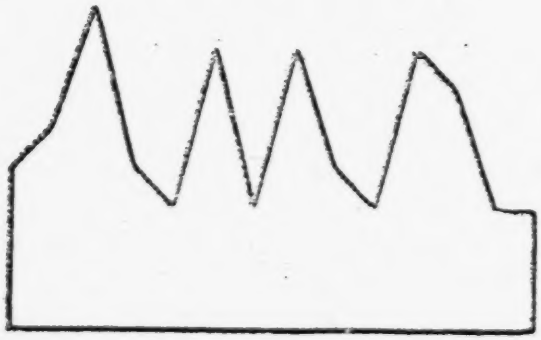

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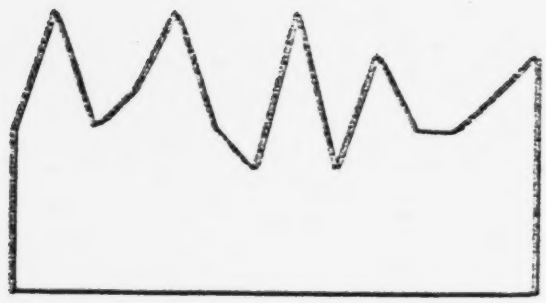

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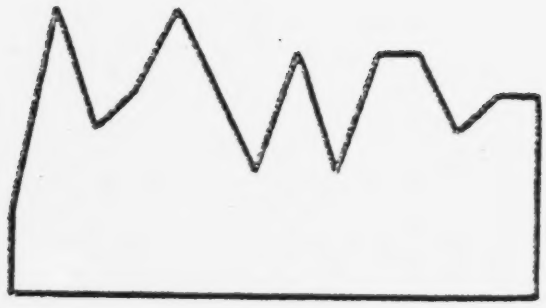

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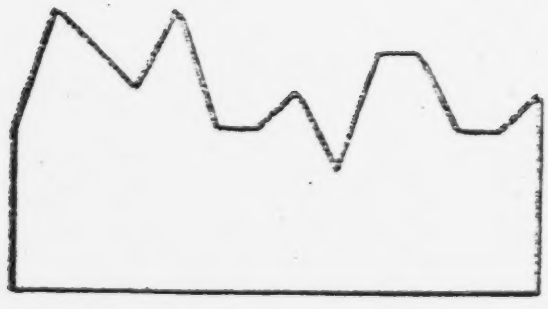

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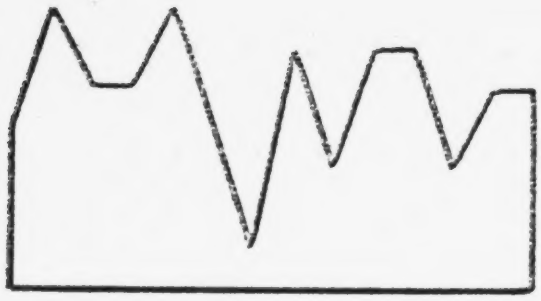

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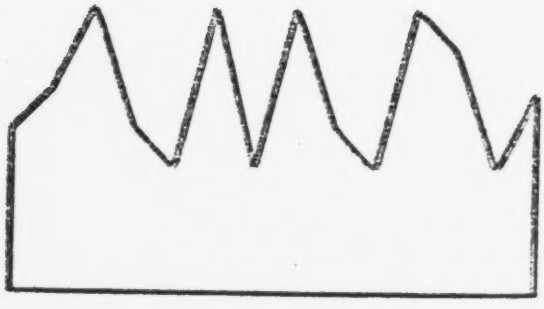

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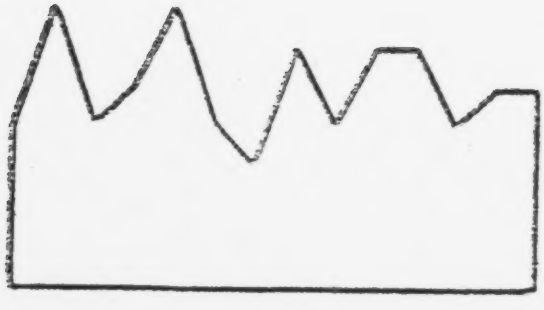

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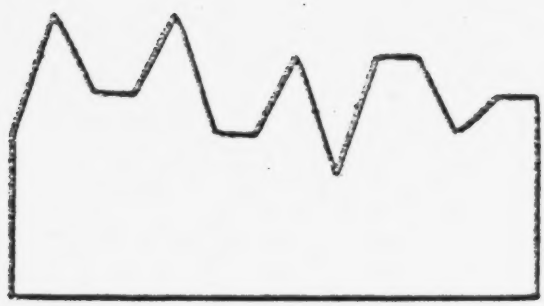

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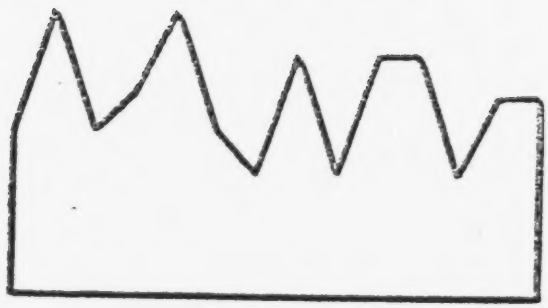

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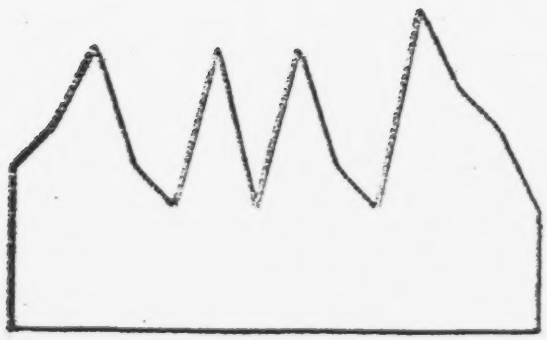

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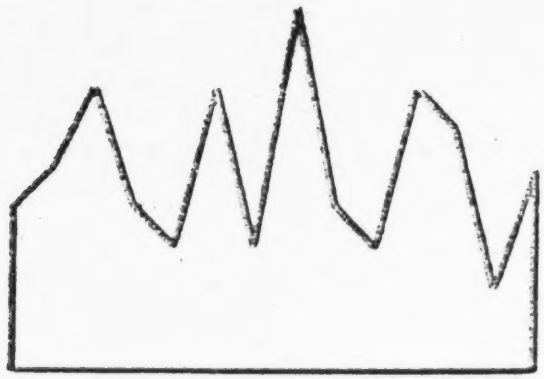

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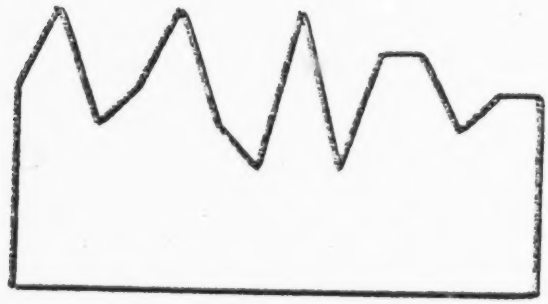

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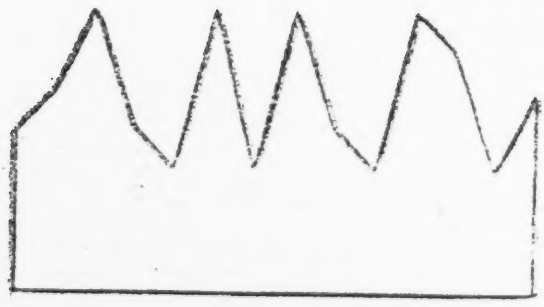

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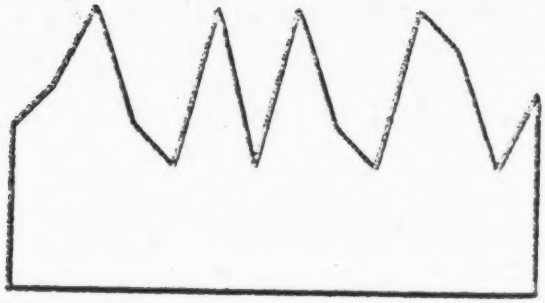

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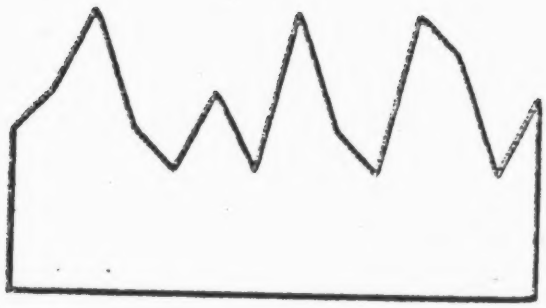

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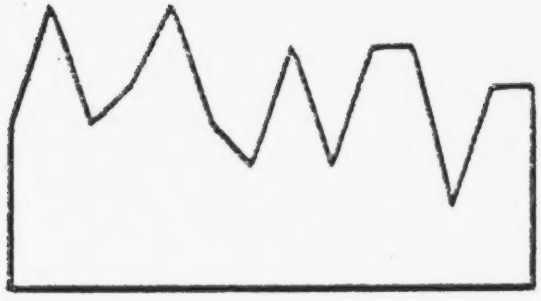

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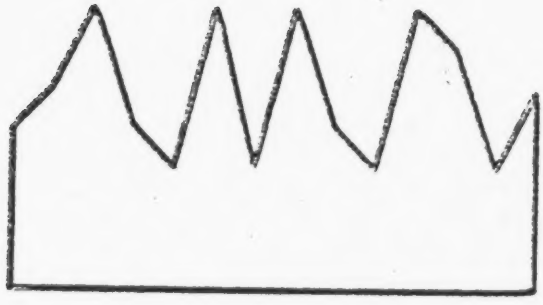

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Task 4

This task is exactly like the first task, except that you will be looking at things which seem like phrases in unfamiliar languages. Let's assume that they are languages, just to make the instructions simpler. In this task, you will find that each page of the booklet contains two phrases, one below the other. Sometimes the two phrases come from the same language; other times, the two phrases come from different languages. Both languages use the same syllables, but they have different patterns for the arrangement of the syllables. Your task is to judge whether they are from the same language or from a different language, and indicate your choice by entering its letter in the appropriate space on the answer sheet:

a. The phrases are very similar and very probably belong to the same language.
b. The phrases are fairly similar and seem likely to belong to the same language.
c. The phrases are not really very similar or very dissimilar and it is hard to say whether they belong to the same language or not.
d. The phrases are fairly dissimilar and it seems likely they don't belong to the same language.
e. The phrases are very dissimilar and quite probably belong to different languages.

Are there any questions? If not, wait for the signal to start.

Answer Sheet for Task 4

1. _____	16. _____	31. omit
2. _____	17. _____	32. _____
3. _____	18. _____	33. _____
4. _____	19. _____	34. _____
5. _____	20. _____	35. _____
6. _____	21. _____	36. _____
7. _____	22. _____	37. _____
8. _____	23. _____	38. _____
9. _____	24. omit	39. _____
10. _____	25. _____	40. _____
11. _____	26. omit	
12. omit	27. _____	
13. _____	28. _____	
14. _____	29. omit	
15. _____	30. _____	

GADUNUSU GEKO VISUGE KOVI

NU GAVI GEDUSUKO GEDUSUKO 1

GEDU NUGAVI GEDUSUKO NU NU

DOVI NUGAVIGE DUNUGAVIGE 15

OMIT

KONUGAVI DU SUKO NUGA VIGE

KOVI GADUNUSUVI GADU NUGA 29

VIGADUNU SUGE KOGADU KOVI

GADUGEKO VIGAGADU NU GEKO 2

SUKO NUGA VIGEDU SUKONUGA

SUKONUGA VIGEDU SUSUKO NU 16

SUKONU SUKONU DUGEGE DU KO

GEKOVIGADU SUGE KOVI GADU 30

NUGADUSUKO NUNUGA VIDUSU

KONUGAVIGE DU SUNUGASUKO 3

KONU NU GAVIGE DUSU KONUGA

DUSU KONUGA VIGE KOVIGE KO 17

OMIT

DUSUKONU GAGE DUSUKO NUGA

NUSU GEKO GEKO SUGEKO VI GA 31

GAVIKONU GAVIGEDU SUKODU

DUNU VIGADU NUSUGE KOVI GE 4

KOVIGADUNU SUGEKOKO VIGA

DUSUKO NUGA SUKONU GA VI GE 18

SUKO NUGA VINU GAVIGE DUVI

SUKO NUGANU GAVIGEDU SUKO 32

SUDU SUKO NUVIGEDU SUKO NU

KOGE KOVIGANU SUGEKO VIGA 5

SUKO NUGANUSU KONUGAVI GE

VIGAGADU NUSUGE KOVIGADU 19

KOVIGA DUNUGADU NUSUGE NU

KOVIGA DUGADU NUSU GEKO VI 33

DUSUKO NUVIGE DUSUKONUGA

GEKOVIGANU SUGE KO VIGADU 6

GIKO VIGADU NUSUVI NUSUVI

KONUGAVI NU GAVIVI GE DUSU 20

KONU GAVIGE DUGEDU SUKONU

VIGADU NUSU GESUGEKO VIGA 34

NUSUGE KOVI GADUNU SUGEKO

VI GEDUSUKO NUGA VIGEDUSU 7

GEKOVIGA DUKOVIGA DUNUSU

KO VI GADUGAKO VIGADU NUSU 21

DUSUKO NUGA VIGE DUSU KONU

DUSUKONU GAVI GEDUSUDU SU 35

GEKONU SUGEKO VIGA DUNU SU

DUNUSUGEKO VIGAVI GADU NU 8

VIGA DUNUGADU NU NUSU GEKO

NUGA VIGEDUDU SUKONUGA DU 22

DUSUKO NUGA VIGEDU SUKONU

GEKOVIGA DUNUSU GEKOVI GA 36

GEKOVIGA DUNU SUGEKO VIGA

KOVIDUNU SUGEDOVIGA DUGA 9

SUKONU GAVI GEDUSU KO NUGA

NUGAVIGEDU SUKO NUGAVIGE 23

GE DUSUKO NUGAVI GEDUSU KO

DU SUGAVINU GEDUSUKO NUVI 37

VI GEKONU SUGENUSUGE KOSU

SUGEGA DUNUSUGE KOVI GAGA 10

OMIT

GADUNU SUGEGE KOVI GADUGE

KOVI GADU NU SUGEKOVIGA DU 24

GEKOVIGA DU NUSU GE KO GEKO

GEKOVIGA DUNUSUGEKO VIGA 38

DUSU VI GE DU SUKONUGAVI GE

GAVIGEDU SUKONUKO NUGAVI 11

VIGEDUSU KONUGA VIGEVIGE

GADUNU SUGEKO VI GA DUNUSU 25

SU GEKOVIGA DUNUSUGE KOVI

DUSUGAVI SUKONU GAVIGEDU 39

OMIT

VINUGADU NUSUGEGADU NU SU

DUSUKO NUGAVIGEDU SUKO NU 12

OMIT

NUSUGEKOVI GA DUNUSUNU SU

VIGE DUSU DUSUGEDUSU KONU 26

GAVI GEDU SUKOSUKONU GAVI

NUGAVIGEDU GAVI GEDUSU GA 40

KOVIGA DUNU SUGEKOVIGA DU

SUKOGA VIGE DUSU KONU GANU 13

GAGA VIGEDU SUKONU GAVIGE

DUDU NUSU GEKOVI GADUNUSU 27

KODUSUVIGE DUVIGEDU SUGE

SUKONU GAVIGEKO NUGAVINU 14

VIGADUNU GE KOVI GA DUNUSU

KOVI GAKOVI GAGE SUSU GEVI 28

Task 5

This task is just like the second task except that you will be looking at more phrases from an unfamiliar language. A number of the examples will be drawn from one language; you will recognize them because they show the same pattern. Other phrases are from many different languages, and so they do not show a common pattern.

In making your answer please choose one of the following responses, and enter its letter in the appropriate space on the answer sheet:

a. I am very sure this phrase <u>is</u> an example of the recurrent language.
b. I am fairly sure this phrase <u>is</u> an example of the recurrent language.
c. It is hard to say if this phrase <u>is</u> an example of the recurrent language.
d. I am fairly sure this phrase <u>is not</u> an example of the recurrent language.
e. I am very sure this phrase <u>is not</u> an example of the recurrent language.

Again, in this task, you should remember the recurring pattern because you will need to recognize it in the next task. Are there any questions? If not, wait for the signal to start.

Answer Sheet for Task 5

1. _____	16. _____	31. _____
2. _____	17. _____	32. _____
3. _____	18. omit	33. _____
4. _____	19. _____	34. _____
5. _____	20. omit	35. _____
6. _____	21. _____	36. _____
7. _____	22. _____	37. _____
8. _____	23. _____	38. _____
9. omit	24. _____	39. _____
10. _____	25. _____	40. _____
11. _____	26. _____	
12. _____	27. _____	
13. _____	28. _____	
14. omit	29. _____	
15. _____	30. omit	

GEVI DUGANUBU SU GA NUBUSU 1

DUGASU VISUVI GADUGE SUSU 15

SUGE GEVIDU GANUBUSUGE VI 29

SUGE VIDUGANU BUGEVI BU SU 2

GEBU NUNU BUVIVISUNU DUGE 16

OMIT

BUSUGEVI DUGA NU BUBUSU GE 30

NUGABUGASU SUBUSU VIBUGE 3

BUSUVIDUGA NUBUSU GEVIGE 17

SUGANU DUGESUGEGE GAGEDU 31

VIDUSUGE VIDU GA NU BUSUNU 4

OMIT

GAVINUNU GAVINUNUBU GENU 18

BUVINUGA DUNUGA DUNUGA BU 32

DU VINU GA BUGESU DUGABUBU 5

GAVIBUNU GE GEVI DU VIVINU 19

VIGEGESU NUVI NUDUDUGE GE 33

BUNU BUSUGE DUGANUBU SUGE 6

OMIT

SUNUBUDU GANUDU GANUBUGA 20

NUBU SUGE VIDUGASU DU GASU 34

NUBU SUGEDU GANUBU SUGEVI 7

BUSUGE VIDUGA SUGEVI DUGE 21

GAGABU SUGA BUBUNU SUGANU 35

VIDU BUGAGADU DUBUNUGA DU 8

NUGADU GESUBU GEGADUBUGE 22

GEDUNU VIVISUVIVI SUGA GE 36

OMIT

VISU NUBU GE GAVINUBUGA NU 9

GANU GEVI DUGANUBU SUGEGE 23

NUBU SUGE VIBUSU GEVI DUGA 37

DUGA NU BUSUGEVIDU GANUBU 10

SUDU GEVIDU GANUGE VIDUGA 24

GEVI NUBUSU GEGEVI DU NUBU 38

GEBU NUDU VIGA SUBU GESUDU 11

SUGESUGABU NUNU GAVI BUVI 25

SUGADU SUSUVIDU BUGEBU NU 39

NUBU DUGA NUBUSUGE VIDUGA 12

SUGEGASUGE DUGA SUBUDU BU 26

NUGE NU GESUDUBUNU SUVIGA 40

VIDUGA NU BUSUGESUGE VIDU 13

SUGA VIBUBU DUGENUGE NUSU 27

OMIT

NUBUSU GEVIDUGA NUBUSU GE 14

BUSU GEVI DUGA NUBUSUGEVI 28

Task 6

This task is just like the third task, except that the patterns are like phrases in unknown languages. There will be new examples of the recurrent language you saw in Task 5. Other phrases will represent examples of a new language and there will be a number of examples from this language also. This task will be much like the previous task in that you are again supposed to identify the examples of the recurring languages you learned in the previous task. To make your answer, choose one of the following responses and enter its letter in the appropriate place on the answer sheet:

a. I am very sure this phrase <u>is</u> an example of the recurrent language.
b. I am fairly sure this phrase <u>is</u> an example of the recurrent language.
c. It is hard to say if this phrase <u>is</u> an example of the recurrent language from the previous task or not.
d. I am fairly sure this phrase <u>is not</u> an example of the recurrent language from the previous task.
e. I am very sure this phrase <u>is not</u> an example of the recurrent language from the previous task.

Are there any questions? If not, wait for the signal to start.

Answer Sheet for Task 6

1. omit	16. _____	31. _____
2. _____	17. _____	32. _____
3. _____	18. _____	33. _____
4. _____	19. _____	34. _____
5. _____	20. omit	35. _____
6. omit	21. _____	36. _____
7. _____	22. _____	37. _____
8. _____	23. _____	38. _____
9. _____	24. _____	39. _____
10. _____	25. _____	40. omit
11. _____	26. _____	
12. _____	27. _____	
13. _____	28. _____	
14. _____	29. _____	
15. _____	30. omit	

OMIT

BUSU GEVI GEBU SUGEVI DUGA 1

GABU DUVIDU VIBUDU VINU SU 15

SUGEVI DUGANUGANU BUSUGE 29

SU GEVI DU GEVIDU DUGANUBU 2

SUGEVIDUNU BUSU GEVI DU GA 16

OMIT

DUVI NUSUGEGA BUDU VIDUVI 30

GEVI DUGANUNU BUSU GEVI NU 3

GEGEGABU DUVINUSUGE GABU 17

NUBUSUGE VIDUGA NUBU SUGE 31

VINUSUGESU VINUSU GEGABU 4

NUSU GEGA DUVI NUSUGEGA BU 18

DUVINUSU GEGA BUDU VINU SU 32

NUSU GEGA SUGEGAGA BUDUVI 5

VI NUSUVI NU SUDUBUBU DUNU 19

NUBUSU GEVIDUGA NUBU NUBU 33

OMIT

BUSUGEVI DU GANU BUSU GEVI 6

OMIT

BUSUGE BUSUGE NUGAGANUSU 20

GANU BUSUGEVIDU GA NUBU SU 34

SU GEGABUDU DUVINUSU GEDU 7

DUVI NUSUGEBU DUVINUSU GE 21

NUBUSU GEVIDUGANU BUSUGE 35

VINU SUGE GABUDU VINU SUGE 8

VINUSUGEGA SUGE GABUDU GA 22

BUDUVI NUSUGEGABU DUVI NU 36

GEVI DUGA NUBU SUGE VIDUGA 9

NUBUSUGE VIGANU BUSUGEVI 23

NUBU VIDUGE GANU BUSUGE DU 37

DUGANUBU SUGEVI DUGADUGA 10

VINUSU GESUGEGA BUDUVI NU 24

NUBU VI DUBUSUGEVI DUGANU 38

DUGANU BUNUBU GANUBU SUGE 11

BUSUGE VIDUGE VIDU GANU DU 25

DUVIGEGA SUBUDUVI NUSUGA 39

SUGE GABU DU VINUSU GEGABU 12

BUSUGEVIGE VIDUGA NUBUSU 26

OMIT

DUVIGE GAVINU SUGEGABUDU 40

GABUDU VINUSU GEGABU GABU 13

NUSU GEGABU DUBUDU VINUSU 27

VIVI DUGANUBUSU GE VIDUGA 14

DUVINU SUGEGA BU DUVI NUSU 28